Founders Village
Blasting Excavation Report
11/05/24

Prepared for
Macor LLC

Prepared by
Highline Engineering and Surveying Company
PO Box 1295
Parker, CO 80134
(303) 889-0044

Table of Contents

I. Founders Vista Blasting and Guidelines
II. Standard Requirements and Preliminary Specifications for Blasting Excavation Operation

I. Founders Vista Blasting and Guidelines

A. Blasting and Excavation Introduction

Unlike earthen material that is encountered in the metro area, rock material is much harder and cannot be excavated with conventional methods. To fracture the material and remove it from the site, rock drilling and blasting is used. Rock blasting involves drilling a hole into the rock and placing explosives materials into the drilled bore holes. A controlled blast is then triggered to fracture the rock so it can be excavated, processed on site or removed from the site. **See Founders Vista Blasting Plan at the end of this report.**

1. **Drilling**: The process starts with drilling holes into the rock and soil. Typically holes will be drilled in a vertical orientation. The location of these holes are carefully planned and takes into account the surveyed excavation plans and proximity of adjacent structures (homes, roadways, natural features, etc.). Blast patterns will be designed and drilled using specific hole diameters, engineered depths, and calculated spacing.

   Blast designers have a virtually unlimited variety of drill patterns and hole orientation that they can use to design construction blasts. The drill pattern burdens and spacing are bound by practical limits based on hole size and depth of the planned excavations. Large blast holes may be as large as 7 inches or 178 mm. in diameter, while small holes may be as small as 3 inches or 76 mm. in diameter. Hole orientation is influenced by project topography, excavation boundary geometry, bench height, blast pattern access, and many other factors. Blast hole patterns for Founders Vista will be drilled dependent on the depth of cuts, proximity of adjacent structures and allowable vibration and air over-pressure limits. Anticipate Founders Vista blast hole patterns can range from 6ft x 6ft up to 15ft x 15ft.

   Another factor in blast design is the delayed (millisecond) timing of the initiation of the explosives in relation to one another. Millisecond timing patterns always alters the rock movement geometry, and hence, the timing creates "effective" burden and spacing values. Timing will affect fragmentation, rock throw, and overbreak. Proper millisecond timing will enhance fragmentation, and improve excavation productivity.

   The Blasting Plan for **Founders Vista Subdivision** will incorporate Delay blasting techniques which is used to manage adverse geologic conditions and control of vibration and air blast effects. Major advantages of millisecond (MS) blasting are:

   1. Reduction of ground vibration and air blast
   2. Improved fragmentation
   3. Reduction of overbreak and flyrock
   4. Improved productivity and lower costs

State of the art non-electric and electronic blast initiation systems allow blasters almost infinite timing flexibility. A combination of surface and in-hole delays are widely used and have proven to be very effective and safe in construction blasting operations.
Another factor in blasting is rock-swell. This can vary from 20-40 percent of the bench volume. This can impact the blast performance if there is limited room. Rock Swell will be considered when blasting near the boundary of **Founders Vista Subdivision**. It can also affect the transportation requirements, which can impact both time and cost.

2. **Placing Explosives**: Once the holes are drilled, explosives are placed inside them. The type and amount of explosives depends on the material being blasted, the depth of cut, subsurface conditions, proximity of adjacent structures and the desired outcome.

   Blast Layout and Powder Factor
   Over the years, blast design rules of thumb have been established to help blast designers prepare initial blast designs. Blast managers continue to evaluate blast performance to continually improve their design and performance. Blast design includes the following:
   1. Hole depth
   2. Burden calculations
   3. Spacing calculations
   4. Sub-drill calculations
   5. Stemming calculations
   6. Inert decking calculations
   7. Load factor and charge weight calculations
   8. Powder factor calculations

3. **Detonation**: The explosives are then detonated in a controlled manner. The energy from the explosion fractures the rock, breaking it into smaller, manageable pieces.

   An explosive is a compound or mixture of compounds which, when initiated by heat, impact, friction, or shock, undergoes a rapid decomposition, releasing tremendous amounts of energy in the form of heat, gas and pressure. This decomposition is a self-propagating, exothermic reaction called an explosion.

   Chemically, there are two fundamentally different types of explosive materials: molecular and composite explosives. Molecular explosives are substances that contain all that is needed for reaction within each well-defined molecule. Pentaerythritol Tetranitrate (PETN) boosters, Trinitrotoluene (TNT) and nitroglycerin (NG) dynamite are examples of molecular explosives.

Composite explosives are mixtures that might contain fuels and oxidizers, and other self-explosive ingredients. Most rock blasting explosives fall into this category, with ammonium nitrate-fuel oil (ANFO) being the classic example when dry blast holes are loaded and Emulsion when wet blast holes are encountered. Some composite explosives also contain ingredients such as water or ballast materials that do not add energy to the reaction but modify the mixture's flow properties or consistency. Without exception, composite explosives must contain some mixture of carbon, oxygen, and nitrogen.

Upon detonation, maximum energy release occurs when the explosive mix is formulated for oxygen balance. When explosives are oxygen-balanced, they generally form water vapor (H2O), carbon dioxide, and nitrogen (N2).

Founders Vista Blast holes are anticipated to be primed with Trojan Spartan Boosters and either a Nonel (non-electric) or Electronic detonator(s). A chemically sensitized pumped emulsion (Titan 1000) blasting agent or a packaged emulsion (Blastex/Blast gel) blasting agent will be used when wet blast holes are encountered. Dry blast holes will be loaded with ANFO (ammonium nitrate fuel oil). The amount of explosives loaded into each blast hole will be determined per the diameter and the depth of the blast holes and the distance(s) to the nearest non-owned structure(s) including the cliff faces, residential homes, utilities and roadways. More accurate calculations will be made after the blast area dimensions and depths are established and the drilling parameters are set.

Explosives Classification

In commercial blasting, explosives and blasting agents are characterized by various properties that define how they will perform under field conditions. These properties include fume class, density, water resistance, temperature effects, detonation velocity, detonation pressure, borehole pressure, sensitivity, and strength.

The density of a material is defined as its weight per unit volume for blasting. Explosive densities are expressed in grams per cubic centimeter (g/cc). Blasters can relate to these metric units because water density is 1 g/cc. Therefore, explosives with densities higher than 1 g/cc will sink in clear water. This is important when blasting in wet areas, where the blaster needs to pump the blasting material to the bottom of the bore hole, fill the entire circumference of the hole while displacing the water.

There are two distinct different reasons for measuring and knowing the relative sensitivity of various explosive compositions. From a safety perspective, it is important to know how sensitive an explosive is to impact, friction, and heat. From a performance standpoint, measures such as gap sensitivity, critical diameter, and minimum primer sensitivity define the "functional sensitivity" of explosives.

When compared with newer water-based explosives, nitroglycerin (NG) explosives are much more sensitive to detonation by impact or friction. Of the four classes of explosives, NG has the highest sensitivity, followed by high explosive water-gels, ANFO, and then emulsion explosives. NG can be set off by shock, whereas ANFO emulsion blends cannot.

The measure of an explosive's sensitivity determines the minimum size of the primer or detonator that is needed to reliably detonate it under normal conditions of use. The ignition sensitivity varies widely for various explosive types. A blast can be initiated with high-sensitivity explosives by using a detonator. Low-sensitivity explosives, such as ANFO emulsion blends, require a booster (usually a very small amount of high explosives) that is initiated by a detonator to cause an explosion. Obviously, low-sensitivity explosives are safer to use because they cannot be set off accidentally.

When explosives detonate, they produce shock and heave energy. The shock energy is produced in the form of stress waves, driven by the explosive's detonation front. The heave energy is produced by the rapidly expanding gases that follow detonation. Actual explosive yields can be measured by a variety of field tests. The total theoretical energy of explosives can be expressed in calories per unit weight or calories per unit volume.

There are other considerations that are important to blasting. One of these is water resistance of the blasting agent, since in many applications explosives are loaded into damp or wet holes. Some blasting agents, such as ANFO, have poor water resistance and will not fire when wet. Temperature levels and fluctuations can affect the stability as well as the performance of explosives.

Whenever possible, contractors typically use ammonium nitrate-fuel oil (ANFO) mix blasting agents for construction blasting. When used properly, ANFO can produce good blasting results with relatively low cost. Number 2 diesel oil is commonly used as the fuel. ANFO can be purchased and handled in either packaged or bulk form. **I**n large scale projects, storing the bulk ingredients requires little special consideration, and loading efficiency is improved by using mechanized systems to handle and load bulk ANFO.

4. **Controlled Blasting Techniques**: To minimize damage to surrounding areas and ensure safety, controlled blasting techniques are used. This includes careful planning of the blast pattern and timing of the explosions. **Founders Vista** is anticipated to incorporate open face blasting techniques to reduce vibration.

   Many interacting factors are involved in the general blast planning process. Blast fragmentation size will influence equipment selection, and visa versa, if equipment

already exists. Excavation schedules and drill bench dimensions will influence blast hole size, explosive selection, and labor requirements. The proximity of blasting to structures can profoundly affect blast planning. Proximity of Blasting near structures for **Founders Vista** will be limited to 200 feet for **Founders Vista Subdivision**. A Rock Fall Analysis has been prepared for **Founders Vista Subdivision**, and **Founders Vista** will implement Rock Fall mitigation devices to be in place prior to any Blasting in order to protect existing homes located below the Western cliff edge.

Because Blasting near structures or urban areas adds a special set of additional concerns. The need for vibration and air-blast monitoring, stringent blast effect control measures, and effective blast area security and warning methods must be evaluated for close-in blasting. Geological conditions will also influence blast planning. Physical rock properties and structural conditions will present special blast control protection devices such as structurally secured netting, rock bolts, a rockfall barrier or berm, etc. to prevent loose material from reaching existing structures for **Founders Vista Subdivision**.

5. **Ground Vibration and Air Blast**: These are important considerations in blasting. Ground vibration can cause damage to nearby structures, and air blasts can create noise and dust. Proper techniques and blast design planning
are used to control these effects.

   When explosive charges detonate in rock, most of the energy is used in breaking and displacing the rock mass. However, some of the energy is released in the form of ground vibration and air overpressure or "airblast." Airblast pulses are usually in frequencies below the threshold of human hearing, but this energy can be felt. Human response to vibration and airblast is very subjective, and people can often feel very low levels of vibration and blast noise.

   Ground Vibration
   When explosives detonate in rock, energy is generated in the form of various surface and body vibration waves. Vibration wave energy decays with distance as it spreads through a rock mass or travels along the ground surface. Some waves pass through the "body" of the rock mass. These body waves are called primary (p) and shear (s) waves. Other waves—like Rayleigh and Love waves—travel along the ground surface. In an ideal isotropic and homogenous rock mass, wave energy would travel evenly in all directions. However, most rock masses are far from ideal, so wave energy is reflected, refracted, and differentially attenuated by various geological and topographical conditions. The elastic property of rock greatly influence vibration magnitude and attenuation rate.

   Vibration Damage Control Criteria
   The U.S. Bureau of Mines recommends the following:

1. Particle velocities of less than 51mm./s (2.0 in./s) show little probability of causing structural damage.
2. If there is at least 8 ms. (millisecond) separation between detonations, the vibration effects of individual explosions are not cumulative.
3. Particle velocity is still the best single ground motion description.
4. Damage potential for low-frequency blasts (< 40 Hz) is considerably higher than that for higher frequency blasts (> 40 Hz).
5. Practical safe criteria for blasts that generate low frequency ground vibrations are 19 mm./s (0.75 in./s) for modern gypsum board partition houses and 12.7 mm./s (0.50 in./s) for lath and plaster interiors. For frequencies above 40 Hz, a safe particle velocity maximum of 51 mm./s (2.0 in./s) is recommended for all houses. **Founders Vista Subdivision** Blasts will be limited to low frequency ground vibrations of 0.75 in./s (CRFD follows NFPA 495 and **this is** found in NFPA 495).
6. Human reactions to blasting can be the limiting factor. Vibration levels can be felt that are considerably lower than those required to produce damage.

Controlling Airblast

Excessive airblast is controlled by ensuring that all charges are properly confined. Excessive airblast is generated by the same poor confinement conditions that cause flyrock. Conditions that cause high over-pressure levels:

1. Inadequate stemming
2. Mud or weak seam venting
3. Inadequate burden confinement
4. Poor blasting timing
5. Focusing by wind or temperature inversions
6. Uncovered detonation cord
7. Overloading

Air blast from detonating chord trunklines can be significantly reduced if it is covered with at least 20 cm. (8 in.) of dirt or sand.

Founders Vista will be required to meet the COLORADO DEPARTMENT OF LABOR AND EMPLOYMENT, DIVISION OF OIL AND PUBLIC SAFETY, EXPLOSIVES REGULATIONS, 7 C.C.R. 1101-9, Effective: May 1, 2019
Air over-pressure (air blast) limitation: Air over-pressure at the nearest dwelling house, school, church, or otherwise occupied buildings shall not exceed 133 dB (0.0129 psi).

B. Safety and Regulations

Safety Gear: Always use appropriate safety gear, including hardhats, ear protection, respirators, gloves, high visibility outer wear, safety glasses and safety toed boots.

Regulations: Follow all local, state and national regulations regarding blasting and excavation to ensure safety and compliance.

1. **Town of Castle Rock Fire and Rescue Department**.
   Code References:
   2018 International Fire Code (IFC) Chapter 56 ,
   National Fire Protection Association (NFPA) 495, 2023.
2. National regulations for blasting and excavation are primarily governed by the **Occupational Safety and Health Administration (OSHA)**1. Here are some key points:
3. **Excavation and Trenching Standards**: OSHA's Excavation standards, found in **29 C FR Part 1926, Subpart P**, outline requirements for safe excavation and trenching op erations1. These standards aim to protect workers from caveins and other hazards1.
4. **Blasting Operations and Use of Explosives**: OSHA also has specific standards for blasting operations and the use of explosives, detailed in **29 CFR Part 1926, Subpart U**2. These standards include requirements for paperwork, training, and safety measures.
5. **Federal Blaster Certification Program**: Blasters must hold a Federal, State, or local license or certificate, and provide proof of formal training or recommendations from past employers. A blasting supervisor must also be designated to oversee all blasti ng operations.
6. **Safety Practices**: Safe work practices include proper planning of blast patterns, use of appropriate safety gear, and control of ground vibration and air blasts to minimize damage to surrounding areas.

C. Castle Rock Fire Department additional Requirements

1. The Town of Castle Rock Fire Department requires Blast Mats or Blast Fabric to cover blast holes located within 1000 feet of existing structures. **Founders Vista** is anticipated to use 4500 psf Geotextile Blast Fabric to prevent flying projectiles from escaping the ground.

2. The Town of Castle Rock Fire Department requires A minimum of one (1) week advance notification is required to all residents and/or occupants within a one thousand (1000) foot radius of the blasting operation. Notification shall be by an acceptable means approved by the Fire and Rescue Department (e.g., a list identifying resident or occupant addresses where letters were distributed may be submitted to the Fire and Rescue Department with the date and time of distribution, etc.). Proof of notification must be provided to the satisfaction of the Fire and Rescue Department.

3. Notifications shall be made by the permittee to the emergency dispatch centers at least 30 minutes prior to blasting and following the last blast of the day. Notifications shall be made by telephone. The non-emergency telephone number to contact the Douglas County Regional Communications Center is (303) 660-7500, and the non-emergency telephone number for Castle Rock Police Department Dispatch is 303-663-6100. Both centers must be notified.

4. Contractors are required to provide A certificate of current liability insurance with a minimum single limit at one-million-dollars ($1,000,000.00).

5. Inspections:

    a. Initial Inspection – NFPA 495, Section 10.2 . The initial Fire and Rescue Department inspection consists of observing pre-blast procedures and verifying safety measures are carried out.
    b. Post Blast Inspection - NFPA 495, Section 10.4 The Fire and Rescue Department Inspection consists of observing post blast procedures and verifying compliance with detonation and demobilization.
    c. Inspections shall be scheduled a minimum of 48 hours in advance. Directions for scheduling are found at:

    http://www.crgov.com/fireinspections

6. **Pre-blast Structure Inspections/Surveys:** Pre-blast structure inspections/surveys will be offered (by a third-party company) to owners of property located within 500 lineal feet of the blast areas. Inspection/survey reports will be submitted and approved by the CRFD prior to the issuance of a Blasting Permit. Inspection/survey reports will be saved electronically and made available to the CRFD, project owner and general contractor.

II. Standard Requirements and Preliminary Specifications for Blasting Excavation Operation

1. Scope

This section discusses blasting operations, with specific focus on the following areas:

- General Requirements
- Radio and Electromagnetic Radiation
- Transporting Explosives
- Transporting Explosives Underground
- Storing Explosives
- Handling Explosives
- Loading Explosives and Blasting Agents
- Wiring operations
- Firing explosives
- Inspection following a blast
- Misfires
- Using safety fuses
- Using detonator cord
- Underwater blasting

2. General Requirements

In addition to the requirements of this section, the transportation, handling, storage, and use of explosives are subject to provisions of ANSI A10.7 - Safety Requirements for Transportation, Storage, Handling, and Use of Commercial Explosives and Blasting Agents; 29 CFR 1910.109 Explosives and Blasting Agents; 29 CFR 1926, Subpart U - Blasting and the Use of Explosives (29 CFR 1926.900 through 1926.914); and 27 CFR Part 55 - Commerce in Explosives.

a. Competent Supervision

A blasting supervisor must be designated to direct and supervise all blasting operations. This includes the transportation, handling, storage, and use of explosives and blasting agents. The supervisor must provide written records of past experience to the employer as evidence of competency.

b. Qualifications

- Personnel. Employees who transport, store, handle, or use explosives or blasting agents must be at least 21 years of age. They must be able to give and understand written and verbal instructions.

- Blasters. Blasters must be qualified through training, knowledge, and experience in transporting, storing, handling, and using explosives, and have a working knowledge of State and local laws and regulations which pertain to explosives. Blasters must hold a Federal, State, or local license or certificate, have proof of formal training attended within the last 5 years, or three recommendations from past employers or explosives manufacturers testifying to the blaster's knowledge and ability to perform in a safe manner the type of blasting that will be required.

c. Blasting Plan

Submit a comprehensive blasting plan before the start of blasting operations and have it approved. The blasting plan may be submitted as part of the overall site safety plan, as required by the "Contractor Requirements" section of these standards (for contract operations) or as a supplementary plan to a Job Hazard Analysis. Explosives must not be transported onto the jobsite before the plan has been approved. The plan must identify proposed methods and procedures for conforming with referenced standards and regulations, and it must include the following information:

- Method and equipment for transporting explosives and detonators
- Type and location of storage facilities
- Type and quantity of explosives and detonators
- Primer assembly procedure and location
- Employee training programs
- Provisions for protecting people, structures, and private and public property
- Provisions for developing and distributing a daily blasting plan covering hole diameter, spacing, loading, and delay patterns
- Provisions for disposal of explosives, blasting agents, and associated materials

d. Security and Inventory

Secure and protect explosives from theft. Maintain an accurate running inventory of all explosives stored at the jobsite. Such records must be available. Promptly report any loss or theft to the appropriate authorities.

e. Notifications

Notify the owners and operators of the facility and take all necessary precautions for the safe control of the blasting operations before beginning blasting operations in the immediate vicinity of buildings, public roads, overhead powerlines, utility services, or similar facilities. At least 24 hours before blasting in the vicinity of gas, electric, water, communications, or other utilities is to begin, the blasting supervisor must notify appropriate utility representatives.

f. Smoking Restrictions

Prohibit smoking, firearms, matches, open flame lamps, fire, heat-producing devices, and sparks in or near explosive storage sites or in areas where explosives are handled, transported, or used.

g. Thunderstorms

Discontinue the handling or use of explosives during the approach and progress of a thunderstorm. All employees must leave the danger areas and seek a place of safety when these conditions are present. Install an approved lightning warning device capable of detecting atmospheric conditions that could produce lightning on the jobsite. Warning devices must be acceptable to the COR or office head before installation.

h. Damage Control

Take precautions to minimize ground vibration, airblast, and flyrock. Include a damage control section in the site blasting plan that addresses these issues. Use blasting mats where flyrock damage is possible. Use modern blasting seismographs and methods to measure ground vibrations and air blast levels at designated structures or locations. Unless otherwise specified, control the blasting so that ground vibrations and airblast levels do not exceed the limits identified in table 4.03-1 and 4.03-2 below:

TABLE 4.03-1 Ground Vibration Limits

Type of Structure	Peak Particle Velocity (inches/second) at Low Frequency (<40 Hertz)	Peak Particle Velocity (inches/second) at High Frequency (>40 Hertz
Modern homes, drywall interiors	0.75	2.0
Founders Vista Sub: Older homes, plaster on wood lath construction for interior walls	**0.75**	**2.0**

Reference: Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, “Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting.” U.S. Department of the Interior, Bureau of Mines, Report of Investigations RI 8507, 1980.

TABLE 4.03-2 Airblast Limits

Instrumentation	Air Blast (decibels)
0.1 hertz high-pass system	134
2 hertz high-pass system	133 Required for **Founders Vista**
5 or 6 hertz high-pass system	129
C-slow (for events not exceeding 2 seconds duration)	105

Reference: Siskind, D.E., V.J. Stachura, M.S. Stagg, and J.W. Kopp, "Structure Response and Damage Produced by Airblast from Surface Mining," U.S. Department of the Interior, Bureau of Mines, Report of Investigations RI 8485, 1980.

i. Warning Signs

Post warning signs at access points to blasting areas.

j. Destruction of Explosives

Deteriorated or damaged explosives, blasting agents, blasting supplies are prohibited. Destroy and remove these and all excess explosives from the site in accordance with the specific written instructions of the manufacturer.

k. Empty Explosive Containers

Destroy empty boxes and combustible packing materials which have contained explosives in accordance with the manufacturer's disposal procedures.

l. Fire

If a fire begins that involves explosives, or where the danger of the fire contacting explosives is imminent, do not fight the fire. All personnel must seek safe shelter; guard the fire area to prevent intruders.

a. Non-Electric Firing Systems

If it is not possible to observe the safe clearance distances from radio frequency (RF) transmitter stations, as set forth in Institute of Makers of Explosives (IME) publication 20, "Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use Of Electric Blasting Caps," use nonelectric firing systems to blast. Electrical detonators must not be stored or used within the IME-specified distances of a transmitter station.

3. Requirements for Transporting Explosives

Transporting explosives by air, water, or on public highways must comply with the provisions of US Department of Transportation Regulations contained in 46 CFR 146-149 -Water Carriers; 49 CFR 171-177 Subchapter C -Hazardous Materials Transportation; and 49 CFR 390-397, "Motor Carriers."

a. Vehicles

Vehicles used to transport explosives must conform to the following requirements:

• They must be in good repair, with all electrical wiring completely protected and securely fastened to prevent short circuits.

• They must have tight floors. Cover any exposed spark-producing metal with wood or other non-sparking material to prevent contact with containers of explosives.

• Do not load them beyond rated capacity and secure the explosives to prevent shifting or dislodgment.

• Transport explosive materials in open-bodied motor vehicles only if they have been

loaded into a portable magazine that is securely fastened to the truck bed. Never transport explosive materials in open-bodied motor vehicles that depend on a fire resistant tarpaulin cover for protection.

• Mark vehicles transporting explosives with reflectorized signs on both sides and the front and rear with "EXPLOSIVES" in red letters. Make letters at least 4 inches high on a white background or placarded in accordance with 49 CFR Part 172, Subpart F - "Placarding."

• Equip them with two or more fire extinguishers with a rating of at least 2-A:40-B:C.

• Inspect them daily before use to ensure that the vehicle is in proper condition for safe transportation. The inspection must determine that fire extinguishers are charged and ready; electric wiring is protected and fastened to prevent short circuiting; chassis, motor, pan, and underbody are reasonably clean and free of oil and grease; fuel tanks and lines are secure and have no leaks; tires are in serviceable condition with proper inflation; and lights, brakes, horns, wipers, etc., are functioning properly.

b. Vehicle Operators

Motor vehicle operators transporting explosives must be at least 21 years old and be properly licensed drivers. Drivers must be physically fit, careful, capable, and reliable. Drivers must not
be unlawful users of, or addicted to, alcohol, narcotics, or dangerous drugs. Drivers must be familiar with applicable local, State, and Federal laws and regulations governing the transportation of explosive materials. Transportation on Federal highways or other public roads requires a commercial driver's license.

c. Caps and Detonators

Do not transport blasting caps and detonators with other explosives unless the blasting caps or detonators are in a closed metal storage container that has at least a 2-inch wood lining. Such containers must be at least 2 feet away from other explosives.

d. Flammable Materials

Do not transport spark-producing tools, carbides, oil, matches, firearms, acids, storage batteries, oxidizing or corrosive compounds, or flammable materials with explosives.

e. Parking

Attend vehicles containing explosives at all times. Do not park loaded vehicles, even if attended, near any bridge, tunnel, or other structure that may be occupied or locations where people may congregate or assemble.

f. Fueling

Do not refuel vehicles while they are carrying explosives.

g. Smoking Restrictions

Employees who transport, handle, or use explosives must not smoke or carry on their persons or in the vehicle matches, lighters, firearms, ammunition, or flame-producing devices of any description.

h. Riders

Permit only the authorized driver and helper to ride on trucks transporting explosives or detonators.

4. Explosive Storage Buckley Powder Company stores explosives off-site at an approved magazine location. All federal, state and local regulations are enforced.

a. Requirement

Store explosives and related materials in approved magazines and in accordance with the applicable provisions of the Bureau of Alcohol, Tobacco, and Firearms as set forth in 27 CFR 55, "Commerce in Explosives." Magazines must be bulletproof, rodent-resistant, weather resistant, ventilated, and constructed to the standards of the Bureau of Alcohol, Tobacco, and Firearms, or the Institute of Makers of Explosives.

b. Magazine Location

Locate explosives magazines in accordance with the State and local laws. The COR or office head must approve the proposed sites before location or construction. Consider contractor and Government offices, shops, etc., to be inhabited buildings when determining magazine locations, quantities, and safe distances.

c. Notifications

Notify local authorities, such as law enforcement agencies and fire departments, of the type, planned quantity, and storage location on the site before bringing explosives onto a site for storage.

d. Detonators

Do not store blasting caps, electric blasting caps, detonating primers, and primed cartridges in the same magazine as other explosives or blasting agents. Locate detonator magazines at least 100 feet from magazines containing other explosives or blasting agents, if unbarricaded, and at least 50 feet away, if barricaded.

e. Combustible Materials

Do not permit smoking or open flame within 100 feet of storage magazines. Remove vegetation and combustible material within 25 feet of all magazines.

f. Security

Securely lock magazines at all times except to inspect or move explosives. Maintain an inventory of all storage and withdrawal of explosives. Inspect magazines storing explosives at least every 7 days to ensure that there has been no unauthorized entry or removal of explosives.

g. Posting

Post areas around magazines with "EXPLOSIVES" signs. Place the signs so that a bullet passing through the sign will not strike a magazine.

h. Storage

Store explosives in their original containers. Store containers of explosives with the top side up as designated on the container. Use the oldest stock of explosives first.

i. Maintenance

Promptly remove debris and combustible material from magazines. When magazine floors become stained with explosives, clean them in accordance with the explosive manufacturer’s instructions.

j. Transfer In and Out

Provide for the safe transfer of explosives in and out of magazines, including providing ramps or walkways, as necessary.

5. Requirements for Handling Explosives

a. Handling Explosives

Handle explosives carefully. Do not drop, throw, or slide them. Carry detonators, primers, and other explosives in separate containers when transporting them manually. When they are not in their original containers, place them in a suitable nonmetallic container for manual transportation.

b. Removal from Containers

Remove explosives from their original containers only as needed for immediate use. Use only non-sparking tools or devices to open such containers. Dispose of empty containers and packing in accordance with the manufacturer's recommendations, or promptly burn them in an approved location.

6. Loading Explosives and Blasting Agents

a. Planning

Plan and schedule excavation so that drilling and loading operations will not conflict. Do not permit loading within 50 feet of drilling operations. Do not permit any activity, other than that which is required for loading holes, within 50 feet of loaded holes or holes that have the explosives in place, ready to load. A qualified blaster must supervise loading operations.

b. Drilling

Do not drill in an area already blasted until examining remaining "bootlegs" (holes that do not detonate full depth) for unexploded charges, as well as the total area, to make sure no unexploded charges remain. Do not insert drills, picks, or bars into bootlegs, even if examination fails to disclose explosives.

c. Loading Areas

Make boreholes ready for loading, and remove equipment and tools not used for loading from the area before delivering the explosives to the site. Isolate the loading areas with appropriate signs or temporary barricades to prohibit access by unauthorized people. While the bare holes are being loaded with explosives, exclude all personnel, other than those involved in the loading of boreholes, from the blast site.

d. Boreholes

Make boreholes large enough to permit loading of cartridges and explosives without forcing. Prime, load, tamp, and fire as promptly as possible with a minimum of exposure to personnel.

e. Tamping

Tamp only with wooden or plastic tamping poles without exposed metal parts. Non-sparking metal connectors on jointed poles are permissible. Seat cartridges by even, steady pressure, and do not tamp primers.

f. Priming

Follow the manufacturer's recommendations in priming cartridges. Make primers up only at the loading area and in quantities limited to the number required for a single round of blasting.

g. Stemming

Stem all blastholes in open work with noncombustible material to the collar or to a point that will confine the charge.

h. Blasting Mats

Where blasting may expose personnel or property to injury or damage from flying material, cover the charges with blasting mats.

i. Loading and Shooting

Do not leave loaded holes unattended or unprotected. If possible, fire all holes loaded on a shift during that same shift. If it is necessary to delay firing because of an emergency, isolate the area and post watchpersons to prevent entry to the area. Conduct aboveground blasting operations between sunup and sundown.

7. Firing

a. Preparation

Before connecting the firing line to the power source, notify all personnel in the danger area of the blast and remove them to a safe area. Make satisfactory arrangements for evacuating the danger area and ensuring that no one enters the area before the blast.

b. Responsibility

The blaster must be in charge of the blasting machine or firing switch, and must connect the firing line to the firing device. The blaster must make all connections from the cap circuit back to the firing device, and the firing line must remain shorted until connected to the firing device immediately before firing.

c. Blasting Signal

Sound the following blasting signal on a clearly audible whistle, horn, or siren before each surface or underground blast:

- Blasting warning: A 1-minute series of long blasts 5 minutes before the blast signal
- Blast signal: A series of short blasts 1-minute before the shot
- All clear: A prolonged blast following inspection of the blast area

d. Posting Blasting Systems

Post blasting signals at all access points, and before each shot, post competent flagpersons at all access points to the danger area.

e. Disconnecting

Immediately following the blast, disconnect the firing line from the firing power source or blasting machine and shunt it. Lock firing switches open.

8. Inspections Following a Blast

a. All Blasts

Before the all-clear signal, the blaster must thoroughly inspect to determine if all charges have fired. The blaster must carefully check wires and search for unexploded charges.

b. All-Clear Signal

Sound the all-clear signal only after satisfactorily completing the inspection.

9. Requirements Regarding Misfires

If you suspect or find a misfire, keep all personnel, except the blaster and employees necessary to handle the misfire, out of the danger area. Prohibit all work in the danger area

except that necessary to remove the misfire hazard. If a misfire occurs while using cap and fuse, all personnel must remain at a safe distance from the charge for at least 1 hour. If other electric or nonelectric initiating methods are used, the blasting supervisor may reduce the waiting period to 30 minutes.

a. Refiring

Refiring is the desired method of clearing misfires. The following actions are mandatory:

- For electrically fired blasts in which broken wires or faulty connections caused the misfire, make repairs, reconnect the firing line, and attempt to fire the charge.
- For misfires originally initiated by detonating cord or nonelectrical detonators, the blaster must inspect lines coming out of the holes, and if they appear to be intact, the blaster can reconnect them and attempt to detonate the misfired holes.
- In blastholes where leg wires are discontinuous or leads or detonating cord cut off, there may still be explosives in the hole that can be reprimed and fired. Remove any stemming in the hole. Float stemming out with water. Place a new primer in the hole and attempt to fire the charge.

b. Removal of Explosives

This procedure must be the last resort. Perform it only when refiring has failed or when refiring would present a hazard. Remove explosives by washing them out with water, or, if the misfire is underwater, blow them out with air.

c. Work Restrictions

Do not permit drilling, digging, or picking until: (1) you have detonated all missed holes or removed the explosive, and (2) the blaster has approved the resumption of work.

10. Use of Detonating Cord

a. Care in Use

Use only detonating cord consistent with the type and physical condition of the borehole, stemming, and the type of explosive. Consider and handle detonating cord in the same manner as other explosives.

b. Installation

Cut the line of detonating cord extending out of a borehole or from a charge from the supply spool before loading the remainder of the hole or placing additional charges. All runs must be free of loops, sharp kinks, or angles that take the cord back toward the oncoming line of detonation.

c. Connections

Detonating cord connections must be competent and positive and in accordance with approved and recommended methods. Make knot-type or other cord-to-cord connections only with detonating cord in which the explosive core is dry. Inspect connections before firing.

d. Use of Delays

When using detonating cord millisecond-delay connectors or short-interval-delay electric blasting caps with detonating cord, follow the manufacturer's recommendations.

e. Connecting Blasting Caps

When connecting blasting caps to detonating cord, tape or otherwise attach the cap securely along the side or the end of the cord, with the end of the cap containing the explosive pointed in the direction in which the detonation is to proceed.

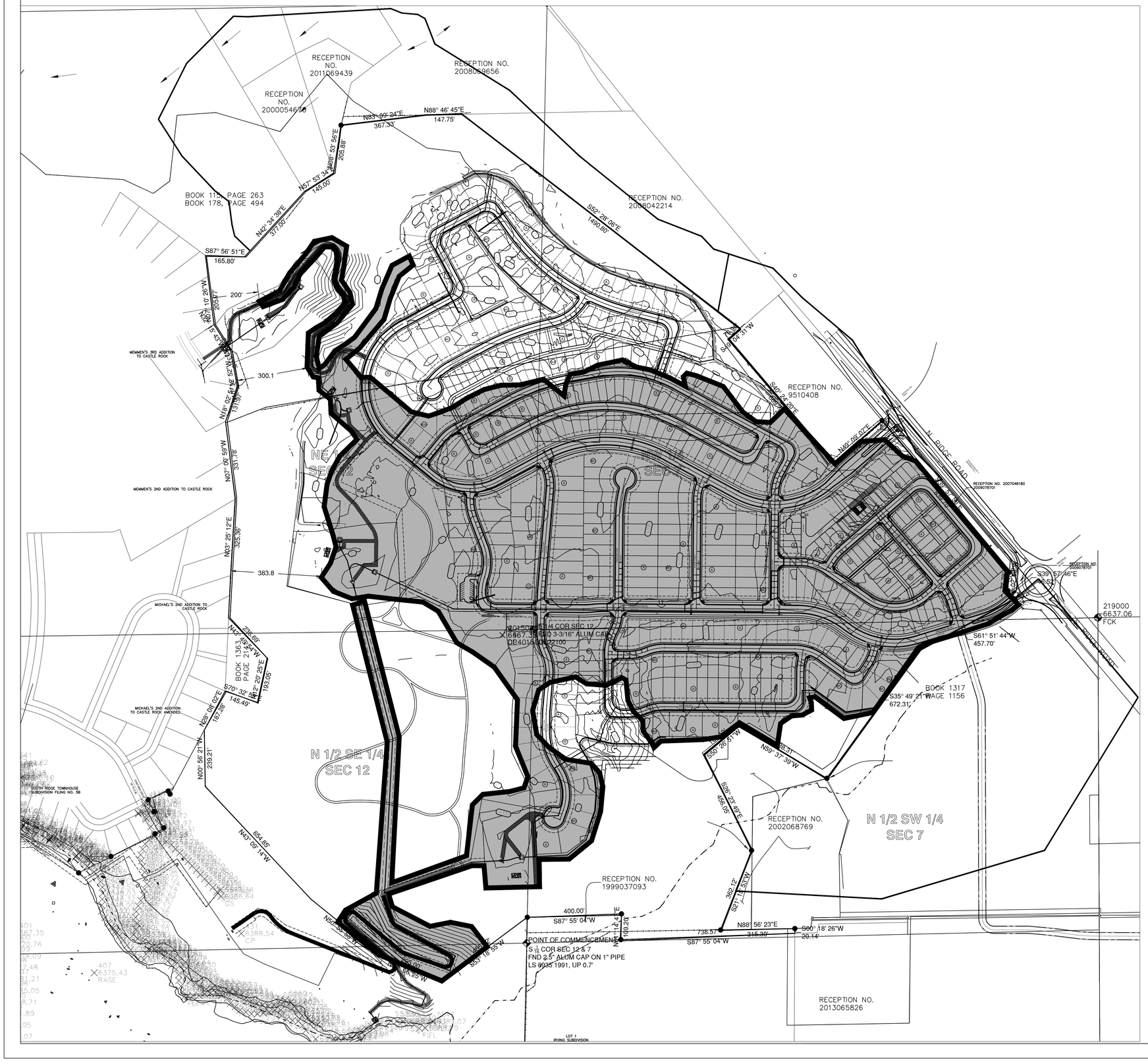
f. Detonators

Do not bring detonators for firing the trunkline to the loading area, and do not attach the detonating cord until everything else is in readiness for the blast.

FOUNDERS VILLAGE

CUT-N-FILL MAP WITH BLASTING AREA

A PART OF THE WEST HALF OF SECTION 7,
TOWNSHIP 08 SOUTH, RANGE 66 WEST 6th PRINCIPAL MERIDIAN,
AND THE EAST HALF OF SECTION 12,
TOWNSHIP 08 SOUTH, RANGE 67 WEST 6th PRINCIPAL MERIDIAN,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO.



200 0 200 400 600 Feet

SCALE: 1" = 200'

CUT-N-FILL MAP WITH BLASTING AREA

HIGHLINE ENGINEERING & SURVEYING

ENGINEERING CONSULTANTS

PO BOX 1295
PARKER, COLORADO 80134

Tel. No.(303) 889-0044
Fax. No.(303) 380-3320

JOB NO. FOUNDERS VISTA

DATE: 11/1/24

SHEET 1 OF 1