2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for this project. It includes a description of the No Action, Alternative 1, and Proposed Action alternatives and presents the alternatives in comparative form, defining the differences between each and providing a clear basis for choice. A summary of the alternatives considered, but eliminated from detailed analysis is included along with the rationale for their elimination.

2.1 No Action Alternative

Under the No Action alternative, LVSSR would revert to conducting avalanche hazard reduction using hand-thrown charges on avalanche prone areas and using the compressed nitrogen powered launch system to place charges in areas not accessible to hand-charge placement. The equipment would be transported by a snow grooming machine to designated firing locations. LVSSR is currently using the howitzer for avalanche control from an open mount located on the SR 156 paved highway turnaround area, under temporary authorization from the USFS.

2.2 Proposed Action

The Proposed Action adds two primary elements to the current avalanche control program, including: (1) permanent authorization of 105 mm howitzer technology to be used for continuing avalanche hazard reduction activities, and (2) the construction of facilities to house the howitzer and ammunition. The structure, magazine, and other elements would be constructed to meet applicable ATF, USFS, State of Nevada, and Clark County regulations.

2.2.1 Site Description

The proposed structure and road would be located on 0.1 acre, with a total disturbance (including both permanent and temporary) of 1.55 acres within the 702-acre LVSSR SUP boundary (Figures 1 and 2). The elevation of the site is approximately 8,660 feet. Slopes on the site are relatively rounded in shape, forming a minor ridge. The ridge slope varies from 1:1 to 2:1 (horizontal:vertical). The project site is located approximately 200 to 300 feet northeast of the ski area parking lot outside the Nevada Department of Transportation (NDOT) highway right-of-way in a turnaround and former air ambulance helicopter landing area, which is unusable at this elevation by the current Clark County air ambulance provider.

Figure 1. Vicinity Map

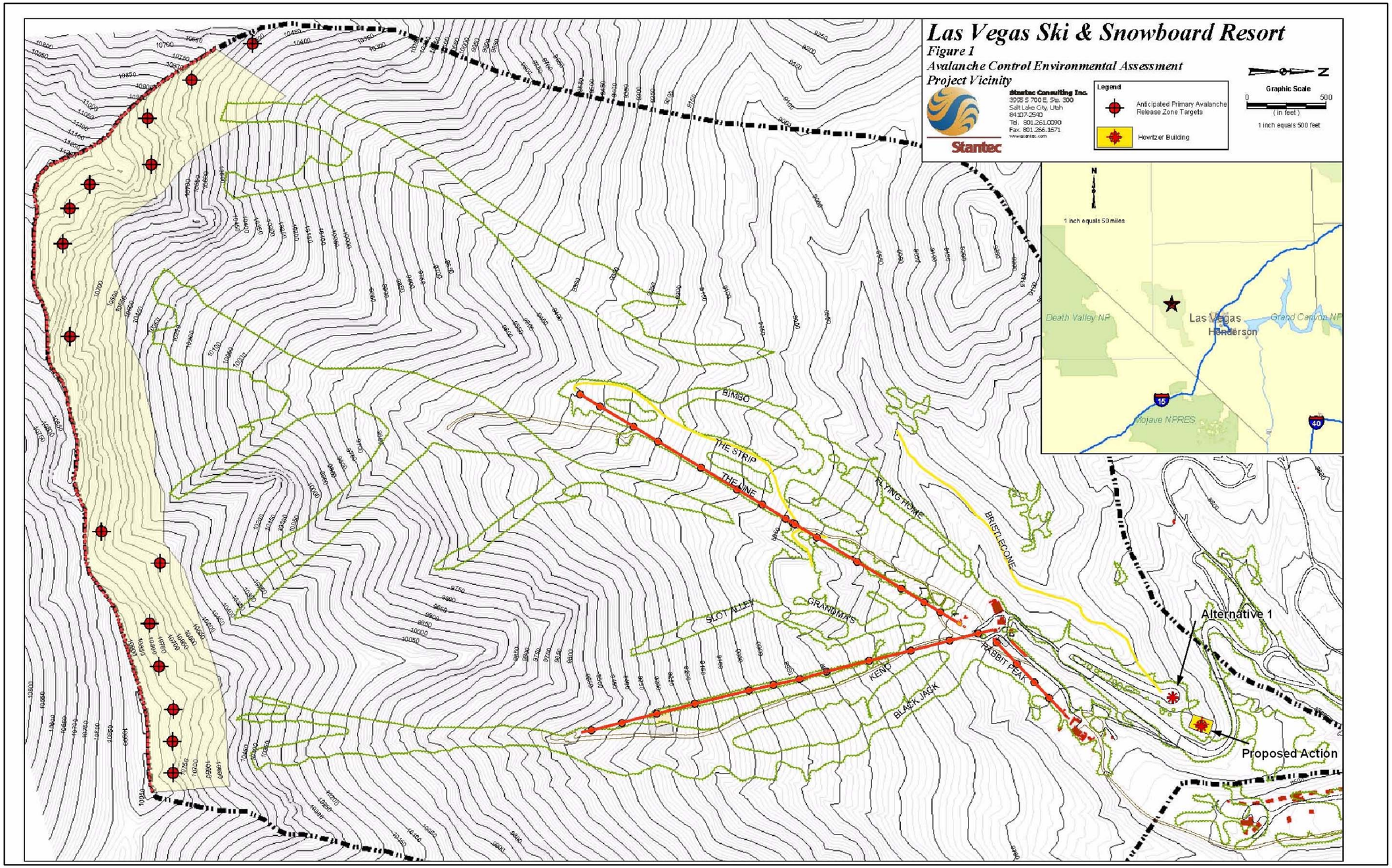


Figure 2. Topographical Map of Proposed Howitzer Building Locations

The potential avalanche starting zones that would be targeted with the howitzer system consist of three main areas known as Chair 1, 3-Springs Cirque, and West Bowl. The starting zones originate below the ridgeline and typically extend approximately 250 vertical feet downslope. The starting zones are very steep and are interspersed with cliffs that range from 50 to 100 feet in height. These areas are the starting zones of avalanches, which can release large masses of snow and remove rocks and trees in the avalanche path. Figure 1 also shows the avalanche starting zone and anticipated primary release point targets.

2.2.2 Proposed Delivery System Description

Equipment Description

The 105 mm howitzer is a World War II through the Vietnam era cannon employed to fire projectiles at relatively high angles at a target, such as a ridge. While no longer used for military purposes, the 105 mm howitzer is the only choice for avalanche control in many ski areas and roadways in the western United States and Canada. Specific advantages of this system for avalanche hazard reduction include:

- Generous positioning capability from a stationary location, ranging from 23 degrees to the right to 22.5 degrees to the left.
- Easy handling and safe operation.
- Compact size and ease of use.
- Reduced dud rate–(less than 1 percent, based on reports of similar equipment used at Alpine Meadows in the Lake Tahoe area).
- Reduced risk from hazards associated with the use of hand-placed charges.
- More accurate targeting capability than the prior nitrogen compressed system.

Use and Restrictions

The howitzer system at LVSSR would be accessed and utilized only by personnel with the appropriate training and certifications meeting ATF, U.S. Army, and USFS requirements. The howitzer would be operated during periods of increasing avalanche hazard prior to opening of the ski area, similar to the past and current avalanche hazard reduction program. The target zones would typically be concentrated in three areas of snow deposition located below the ridgeline and within the SUP boundary. These zones are the same areas that were targeted with the compressed nitrogen system.

A team of three people would conduct an avalanche hazard reduction mission with the howitzer. The team would be trained and certified on an annual basis in accordance with Avalanche Artillery Users of North America Committee standards. Prior to an avalanche reduction mission, the ammunition for the howitzer would be assembled by the mission team.

Avalanche hazard reduction missions are currently conducted from November through March and are dependent on the type and intensity of snowfall and wind. Under Alternative 1, approximately 12 control missions would occur during each season (the same frequency as under the current system). While the variability of storms does not

allow for a prediction of the most active months for missions, it is estimated that most missions would be conducted from late December through early February. On rare occasions, missions may be conducted in October through November or March through April. Under both the No Action and the Proposed Action, the avalanche control missions would typically be conducted during early morning hours when there is sufficient light for viewing the mission results. The target acquisition procedure would be conducted as part of the team's training and would also be done in the early morning hours (likely over several days). Both targeting training and avalanche control would take place following winter storms in early hours of the morning, where the probability of hikers using the area is extremely low. The timing of the training and control missions are dictated by weather conditions and are industry standard practices. The subject training, including the target acquisition procedure, was completed in January 2007 for the current howitzer operating crew; future training/target acquisition of any new personnel would be performed as described above and conducted onsite and/or at the Nellis Air Force Base test and training range.

Under the Proposed Action, the entire ski area would be closed during avalanche hazard reduction activities. In addition, as for current howitzer operations under the USFS Temporary Authorization, access would be controlled on the road to the ski area at a location above the entrance to the Dolomite Campground, and personnel would be stationed along the road in this area to prevent unauthorized entry during control missions.

Projectile Materials

Under the Proposed Action, No Action, and Alternative 1 options, there would be no appreciable change in the type of materials used in the projectile explosives, which would consist of common mixtures of explosives that include trinitrotoluene (TNT) and cyclonite or cyclonite-like compounds, as described below. The total payload of explosives delivered to the avalanche release zone each season would also remain approximately the same (360 kg). Table 2 provides a comparison summary for each alternative.

The prior compressed nitrogen avalanche reduction system explosives consisted of pentolite, a mixture of trinitrotoluene (TNT) and pentaerythritol tetranitrate (PETN). TNT is a constituent of many explosives. In a refined form, TNT is highly stable and can be stored over long periods of time. It is relatively insensitive to blows or friction. PETN has characteristics similar to those of cyclonite and is mixed with TNT to form the pentolite. PETN is the most stable and least reactive of the explosive nitric esters. It is also insoluble in water.

In the howitzer system, the explosive consists of "Composition B," a castable mixture of cyclotrimethylenetrinitramine (RDX) and TNT. In some cases desensitizing agents (usually water and a wax) are added to the mixture.

RDX, or cyclonite, is a white crystalline solid usually used in mixtures with other explosives, oils, or waxes; it is rarely used alone. It has a high degree of stability in storage. RDX has very low solubility in water and has an extremely low volatility.

Table 2. Comparison of No Action, Proposed Action, and Alternative 1 Avalanche Control Technology, in Relation to Potential Hazardous Materials Sources

Equipment, Mission, Payload	No Action	Proposed Action and Alternative 1	Difference Between No Action and Alternatives
Projectile Launcher	Nitrogen-compressed launch system and hand-charge placement	105 mm howitzer	Use of new equipment (howitzer) for Proposed Action and Alternative 1.
Payload (kg per mission)	1 kg (2.2 lbs.)	Approx. 2 kg (4.4 lbs.)	Increase of approximately 1 kg per mission
Estimated Control Missions per Season	12	12	None
Estimated Shots per Mission	30	15	Reduction of 15 shots per mission.
Estimated Total Payload Delivery (per season)	360 kg	360 kg	None
Payload Materials	Pentolite (mixture of TNT and PETN)	Composition B (mixture of TNT and RDX)	No appreciable change. Both contain TNT and a cyclonite or a cyclonite-like compound.

2.2.3 Proposed Facility Description

Storage Structure and Magazine

The proposed structure would be approximately 642 to 900 square feet (pending final design approvals) and approximately 13 feet in height, from the platform grade to the top of the roof. For accessibility and positioning purposes, it would be in proximity to a paved road with direct line-of-sight visibility of potential avalanche starting zone target areas (Figures 1 and 2). The structure would be designed to offer a high degree of security for storage of the howitzer.

For security purposes, doors would have substantial interior reinforcing and locking mechanisms. During final design it may be determined that windows or ceiling vents are required to relieve interior discharge pressures during equipment operation or to provide ventilation. If windows or ceiling vents are necessary, they would be designed to prevent human access. Both doors would be illuminated, and a security surveillance system would be installed. Lights will be special low reflective lights to help maintain night sky visibility, while meeting ATF security and safety requirements. Other interior elements could include a work bench, tool storage, safety equipment, waste receptacles, and a crane system for moving the ammunition.

The structure would be designed to allow the howitzer to be fired from a stationary location. The building design allows a portion of the walls and ceiling to retract so the control missions may be accomplished without moving the equipment. One side of the structure would have a standard size walk-through door for normal access. It would include a magazine to store the ammunition constructed of reinforced concrete at least 8

inches thick located below the structure. The magazine would be approximately 20 feet by 20 feet (approximately 400 square feet), 8 feet high and be located entirely below ground level (Figure 3). Access to the magazine would be from inside the howitzer storage structure, either down a flight of stairs or via a ship's ladder system. As with the rest of the structure, construction of the trapdoor, hinges, and locks to the magazine would be designed to meet ATF standards.

A crane system would be installed inside the structure to lower ammunition into the magazine for storage, and to retrieve the amount needed for each control mission. Depending on final interior engineering design, the crane would be wall-mounted or a bridge or gantry type where the hoisting mechanism travels on an overhead fixed or moveable runway structure.

The amount of ammunition stored in the magazine is dependent on ATF and Army approval, based upon standards for construction, security, and distance to public roads.

The intent is to store sufficient ammunition for a single season so that the delivery of ammunition to the site is minimized. The required ammunition would be transported from the U.S. Army depot location by licensed transporters following Department of Transportation, NDOT, and U.S. Army requirements.

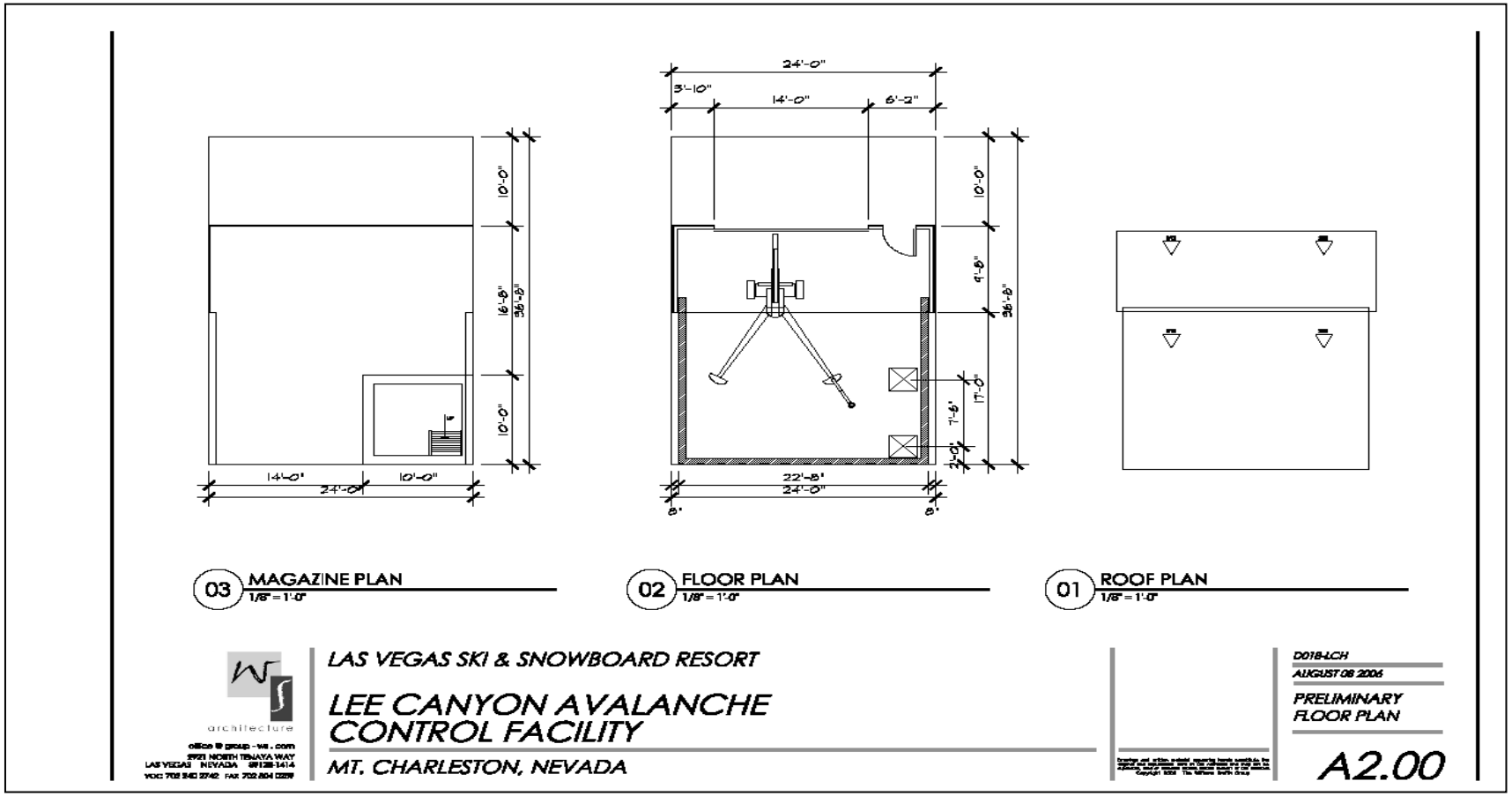
In order to meet ATF regulations in the *American Table of Distances* (18 U.S.C. Chapter 40), a variance may be required from ATF for the magazine location. The type of variance required would depend upon several factors in the final design: exact structure location, distance from the magazine to SR 156, and the amount of ammunition stored in the magazine.

The location, design, and construction of the structure as well as the magazine would require approval by the ATF in accordance with the ATF *Federal Explosives Law and Regulations* (U.S.C. Chapter 40). The use and maintenance of the howitzer is subject to the approval and supervision of the USFS, including the Winter Operating Plan and Snow Safety Plan, and in conjunction with AR 725–20.

A concrete pad would be located on the south side of the structure. The purpose of the pad is to provide a stable platform and turnaround space for vehicles hauling the howitzer and ammunition. The pad would extend the width of the structure and extend approximately 10 to 15 feet depending on final structure design.

In addition to meeting the security requirements, the design and materials used to construct the structure would be complementary to the look and feel of the surrounding forest and other resort structures, by using muted tone colors and materials such as split face concrete masonry blocks, or cast-in-place concrete accented with weathering steel such as Core-ten™. Weathering steel is a durable material that develops a dense oxide that results in a rustic finish and rich tone when exposed to the atmosphere. Both the

Figure 3. Building and Magazine Layout with Roof Detail



structure color and exterior will be reviewed by a USFS landscape architect prior to construction (Figure 4).

Access and Utilities

Construction and permanent access to the structure would be on a graded, gravel road at natural grade. The access road would be approximately 20 feet wide by 120 feet long. Non-winter LVSSR parking would be available on the concrete pad. Winter access would be on foot via the parking lot. The access route would be gated or otherwise closed to the public vehicle traffic.

Water and sewer are not required in the structure; therefore, no services would be provided.

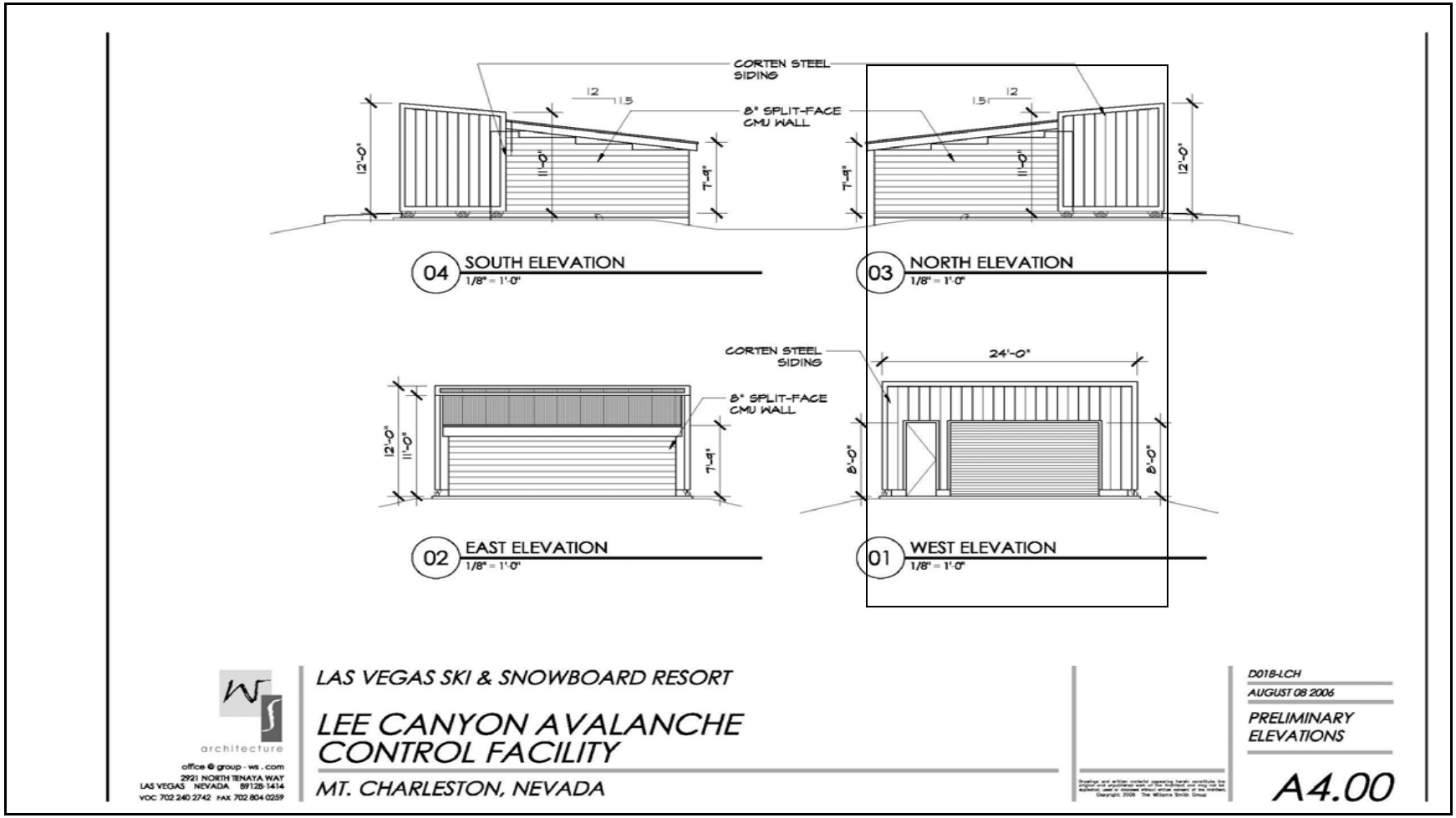
The structure would have electricity and telephone cables placed in a trench from the existing lodge structure. The trench would be approximately 3 feet deep by 4 feet wide and would follow the existing road or walkway footprint from the lodge to the parking lot, a distance of approximately 500 linear feet. The utilities would extend across the parking lot, continue along the existing edge of parking to the access road, and thence along the access road to the proposed structure site (a distance of approximately 500 linear feet). The total length of the proposed utility trench is estimated to be 1,000 feet, constructed primarily through previously disturbed areas. Total area of disturbance for access and utilities is detailed in Table 3. The USFS will modify the permit held by Nevada Department of Transportation (NDOT) to exclude the portion of SR 156 where the howitzer storage facility will be located.

Table 3. Total Area Disturbed During and After Construction

Project Element	Permanent disturbance (in square feet)	Temporary Disturbance (in square feet)	Total Disturbance (in square feet)
Concrete pad	15 x 30 = 450	50 x 50 = 2,500 – 450 = 2,050	2,500
Structure	40 x 40 = 1,600	250 x 250=62,500 – 1,600 = 60,900	62,500
Access road	20 x 120 = 2400	20 x 120 = 2,400 – 2,400 = 0	2,400
Utility trench	Previously Disturbed Area	Previously Disturbed Area	0
Total:	4,450 square feet or 0.102 acres	62,950 square feet or 1.445 acres	67,400 square feet or 1.547 acres

The structure and magazine would be constructed with standard construction techniques. Construction materials storage would be located in the adjacent ski area parking lot and a crane would be used to transport heavy items to the site. If blasting were required, a 500 foot area surrounding the blast site would be closed to the public during this operation. The campground and County camp operators would be contacted to help assure camper safety. Vehicle turn-around will be maintained during the construction period.

Figure 4. Howitzer Building Exterior Design Concept



2.2.4 Conservation Measures

The following conservation measures will be used to minimize the potential for project-related effects:

- The environmental commitments described in Table 7 of the LVSSR 2007 Anticipated Summer Work Plan (NewFields 2007a) would be implemented as applicable. In summary, these commitments include:
  - Implementation of standard Best Management Practices (BMPs) and engineering practice to control drainage and minimize soil erosion, sedimentation, and pollution.
  - Performance of pre-construction biological surveys to identify any sensitive plant or animal species in the proposed construction area.
  - Implementation of standard measures to prevent propagation of invasive plants, noxious weeds, and non-native species.
  - Implementation of measures to minimize the entrapment of wildlife during construction.
  - Performance of pre-construction cultural surveys (or review of existing data) to identify any cultural resources in the proposed construction area.
  - Delineate permitted construction zones from environmentally sensitive areas and flag/mark work areas to ensure construction is confined to these zones.
- A temporary construction fence would be installed around the perimeter of the structure site to prevent stray rocks from rolling off the site and potentially damaging sensitive plant species or butterfly host plants. This fence would be removed at the completion of construction.
- An erosion control mat on disturbed areas around the structure site may be employed as necessary or as specifically directed by the USFS or the U.S. Fish and Wildlife Service. In addition, a line of straw wattles may be placed along the slope above the road as required to prevent larger debris, rocks, etc., from falling onto the road and into the path of vehicles.
- Excavated material that is not utilized onsite for fill and topsoil replacement would be transported to the existing disturbed area of the lower parking lot. Excavated materials will be placed in a location in the lower parking lot where they will not increase erosion problems.
- The chances of spreading invasive plants, noxious weeds, and non-native species would be reduced by following measures outlined in the Humboldt-Toiyabe National Forest's *Draft Best Management Practices for Road Construction and Heavy Equipment Use Prevention Guidelines for Noxious Weeds* (USFS 2004).
- Vegetation within the project workspace will be cleared. Topsoil will be removed and stockpiled for replacement after construction is complete. The contractor will make a single attempt to remove, salvage, and relocate existing small (2 to 3 feet tall) trees located within the site boundaries. Any salvaged trees will be placed in

temporary containers to prevent desiccation of the roots and mortality of the trees. Upon completion of construction, trees will be replanted in the disturbed areas.

- Downed and larger woody material removed to clear the site will be cut and placed in piles as directed by USFS to create refuge habitat for small mammals such as chipmunks, except where considered a fire hazard.
- An environmental monitor would be responsible for ensuring these measures were in place during ground-disturbing activities and would prepare weekly reports for USFS review.

2.3 Alternative 1

Alternative 1 is identical to the Proposed Action as described in Section 2.2, except for the location of the storage facility housing the howitzer and ammunition. Under Alternative 1, this facility would be located on the paved highway turnaround area just off SR 156 (the main road to the ski resort) as shown on Figures 1 and 2. The site consists of relatively flat terrain, and its elevation is approximately 8,680 feet.

As shown in further detail on Figure 5, the howitzer storage facility would be located on the northeast portion of the turnaround area. To assess the potential for effects of the facility location on emergency response, access and turnaround tests have been performed with helicopters and the maximum-sized emergency vehicle (fire truck) that would use the area. These tests indicate that the storage facility would not cause restrictions or hinder the continued use of the area by either emergency response helicopters or vehicles. Additionally, tests using oversized trucks with trailers also indicate that these types of vehicles could continue to use the turnaround area successfully as required.

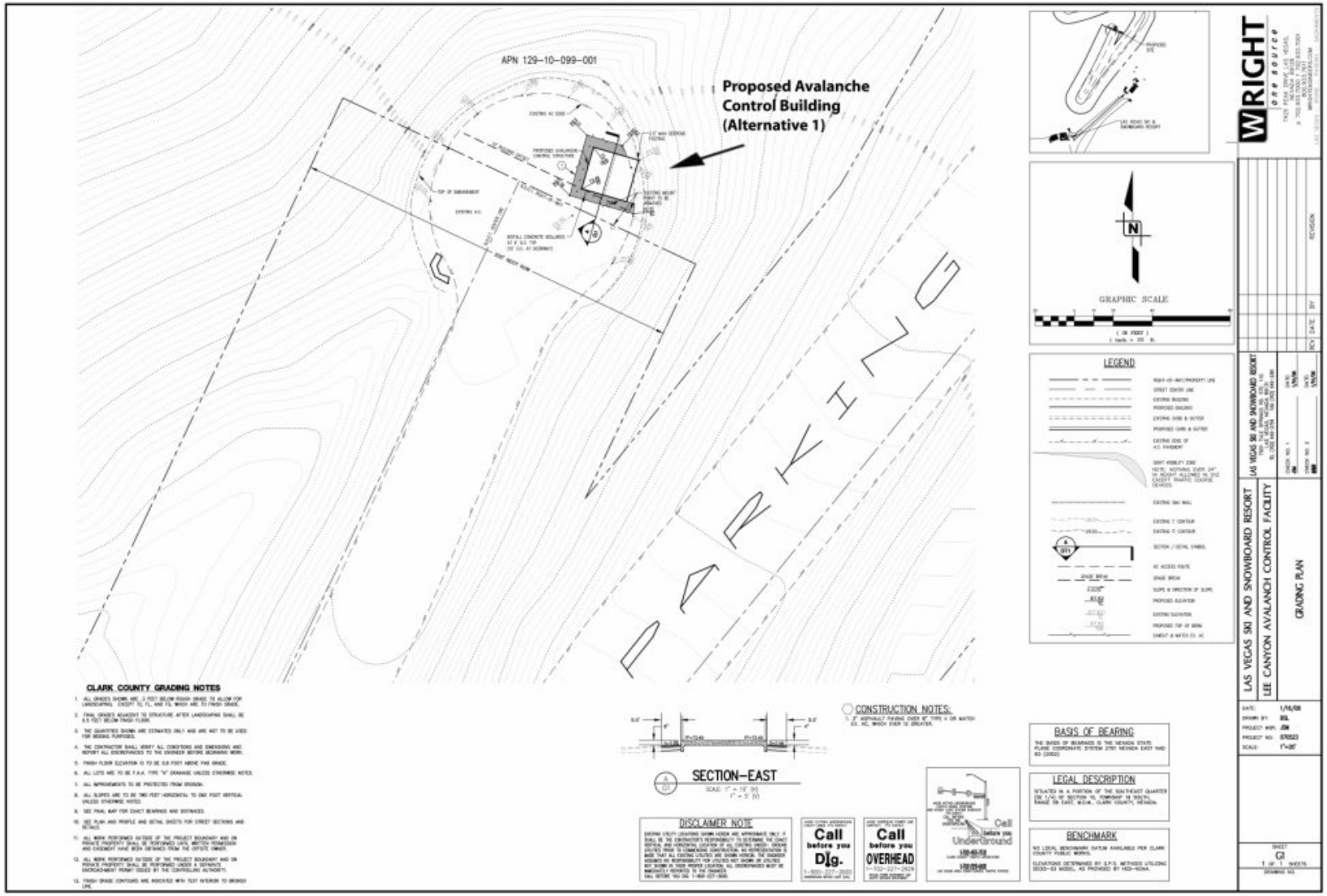
Since the structure would be located immediately adjacent to the highway, no new access road would need to be constructed. Similar to the Proposed Action, the electrical and telephone utilities would be installed adjacent to SR 156; however the location of the facilities would be closer to the Lodge (near the electrical/telephone source), and the total length required for the utility corridor would be approximately 200 to 300 feet shorter.

Alternative 1 would result in less construction-related disturbance because the storage structure would be built on a previously disturbed footprint, no access road would be needed, and the utility corridor would be shorter. Alternative 1 would result in less ground disturbance to previously undisturbed ground and less vegetation would have to be removed; therefore, Alternative 1 would be entirely consistent with the USFS SMNRA Plan Objectives 11.23 and 11.59, which emphasize the use of disturbed areas when expanding recreational facilities.

2.4 Alternatives Considered but Eliminated from Detailed Consideration

A NEPA review specifies the Purpose and Need for an action, describes the Action, and identifies reasonable alternatives. A potential alternative may be eliminated if it would: (1) not satisfy the Purpose and Need, (2) be technologically infeasible, (3) be clearly

Figure 5. Proposed Avalanche Control Building on Highway Turnaround



unreasonable, (4) be illegal, (5) be a duplication within the existing range of alternatives, (6) conflict with a Decision already made, (7) result in an unacceptable level of predicted environmental harm, (8) not be able to be implemented, (9) be prohibitively expensive, and (10) be speculative in nature. This section describes those alternatives that were considered and eliminated with a brief explanation of the rationale for their elimination.

Avalanche Hazard Reduction System Alternatives

- ***Use of additional compressed nitrogen systems.*** To increase the coverage of the prior nitrogen compressed system, additional identical systems could be installed at a number of additional designated firing locations. However, due to the limited range of these systems, the nature of the avalanche paths, and the need for personnel to visually observe the target zone when using this system, these firing locations are potentially vulnerable to triggered avalanches. This may expose the avalanche hazard reduction teams to additional, unacceptable safety risks. Construction of additional firing locations would also require additional ground-disturbing activities along ridges and in gully areas. For these reasons, this alternative was not considered in detail.

- ***Use of additional hand-thrown charges.*** This alternative would require that avalanche hazard reduction personnel climb through potential avalanche paths and hand-throw charges to release potential avalanches. Climbing to the ridge in inclement weather is exceptionally dangerous. If access to the ridge were possible, hand-thrown charges would need to be thrown accurately over several hundred feet to reach the starting zones. The procedure could take several days to reduce risk on all avalanche paths. The control procedure exposes the teams to an unacceptable level of avalanche risk. Because of the increased safety risk to the avalanche reduction team, the alternative was not considered technically feasible and therefore not explored in detail.

- ***Use of helicopters to provide access to avalanche starting zones.*** Helicopters could be used to transport avalanche personnel above starting zones. This alternative would require that explosive devices be carried inside the helicopter, increasing risk for aircraft personnel. In addition, wind and weather conditions may result in periods when helicopter access would not be possible for several days even if a suitable, secure landing zone could be found and used with heavy snow cover. This alternative was not explored in detail due to the safety concerns and the uncertainty associated with adverse winter weather conditions.

- ***Use of lift-served access to the ridge.*** Under this alternative, a chairlift would be constructed to the ridgeline and avalanche hazard reduction personnel would ride the lift in order to direct hand-thrown charges. Due to concerns about hand-thrown charges identified in the alternative above, plus the ground disturbance required to construct a chairlift, this alternative was not carried forward.

- ***Use of remote controlled cable system to deliver charges.*** This type of system is employed in some European areas to remotely transport and detonate charges. The explosive charge is stored in a cabinet on the mountaintop; radio controls provide

instructions to remotely transport the charge on a suspended cableway over the avalanche starting zone and detonate it at the appropriate time. For this project, at least three cable systems would be required, with cables spanning the target zone and explosive devices stored on the ridgelines. This alternative would require helicopter delivery of heavy loads of wire, rope, concrete, structures, and other supplies. The elevation and dramatically varying wind patterns would expose the people on the ground attempting to off-load slings and would be dangerously unsafe. Additionally, this alternative would require extensive ground-disturbing activities not required for the Proposed Action. The feasibility of this system at LVSSR is low, primarily due to ground-disturbance issues and topography. Therefore, this alternative was not carried forward.

- ***Use of fixed gas-explosion devices.*** This system, used in Europe and North America, is typically known as Gaz-ex. It consists of large funnels (36 to 48 inches in diameter), placed on concrete pads above the starting zone. The funnels are filled with propane (or other gas) from an adjacent location. When snow release is planned, the gas is exploded and the concussive force releases the snow. Six to eight of these devices would be required to meet hazard reduction goals for the ski area. As with the previous alternative, similar concerns associated with safety, the extent of ground-disturbance, and topographic difficulty of locating the system resulted in this alternative not being carried forward.

Storage Structure Alternatives

- ***Locating the structure in the maintenance yard area.*** Sufficient space is available in the maintenance yard for the howitzer storage and maintenance structure. However, two of the three main avalanche paths and starting zones are not visible from a location in the yard, precluding the use of the system from that area. The howitzer and ammunition would need to be transported before each use to a firing location. In addition, the location is closer to adjacent private properties than the proposed location. Locations in the maintenance yard did not meet the purpose and need for the project and were not carried forward.