CHAPTER 3.0

AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the existing or affected environment, including conditions and trends that could be affected by the alternatives described in Chapter 2. The affected environment also sets the foundation for understanding and evaluating the alternatives discussed in Chapter 2 and the environmental consequences discussed in Chapter 4. This chapter presents information about the landscape, cultural, natural, and human environment as either a resource, or a resource use.

This chapter focuses on those portions of the environment that are directly related to the conditions and resource categories being addressed by the alternatives. The description is not meant to be a complete portrait of the study area, but is intended to portray the conditions and trends of most concern to the public and the Bureau of Land Management (BLM). Indicators for the impact assessment have been established by resource to better assess the consequences of each alternative.

BLM is directed to use available data when preparing the Environmental Impact Statement (EIS) and does not use the EIS process to generate substantial amounts of original (new) data. The majority of the data that are used to characterize the affected environment were collected from the Challis Field Office of the BLM; Federal, state, county, and local agencies including but not limited to the U.S. Fish and Wildlife Service (USFWS), U.S. Geologic Survey (USGS), Idaho Department of Fish and Game (IDFG), and the Idaho Department of Environmental Quality (IDEQ). The data include published and unpublished reports, maps, and data in digital format.

In accordance with the National Environmental Policy Act (NEPA) regulations codified in Title 40 Code of Federal Regulations (CFR) 1502.15 (40 CFR 1502.15), the affected environment section discusses the existing condition of the human and natural environment that potentially could be affected, beneficially or adversely, by the alternatives. The affected environment is characterized by the following:

3.0.1 Critical Elements Not Affected or Present Within the Proposed Project Area

Wetlands

There are no wetlands within the Proposed Project Area.

Wilderness

There are no wilderness areas within or adjacent to the Proposed Project Area.

Farmlands

There are no prime or unique farmlands located within the Proposed Project Area boundaries, and no impacts to adjacent farmlands would occur under any of the Proposed Project alternatives.

3.1 PHYSICAL RESOURCES

3.1.1 Air Quality

The three types of air pollutants that occur at the quarry site are 1) vehicle emission from gasoline-powered and diesel-powered vehicles and equipment, 2) dust created by mining activities and use of dirt roads, and 3) releases of Carbon Monoxide, Nitrogen Oxide, Sulfur Dioxide, and course particulate matter (dust) during blasting.

All land administered by the BLM has a Prevention of Significant Deterioration Class II status (Clean Air Act Amendments of 1977), for which moderate air quality deterioration associated with moderate, well-controlled industrial and population growth is allowed (USDI 1998). Idaho air quality is under the jurisdiction of the U.S. Environmental Protection Agency (EPA) Region 10, but monitoring and enforcement of air quality regulations are conducted by the IDEQ, which routinely measures ambient air criteria pollutants, including carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. Custer County is designated as an attainment area and does not currently have any air quality areas of concern (IDEQ 2006a). In addition, the Idaho Administrative Procedures Act (IDAPA) requires that all reasonable precautions be taken to prevent particulate matter from becoming airborne (IDAPA 58.01.01.651). The potential for particulate matter levels to be elevated by the mining operations was raised as an issue of concern by the public. To address this issue, the baseline data on particulate matter in the region is described below.

IDEQ monitors air quality at selected locations throughout the State. The closest air quality monitoring station to the Proposed Project Area is located in Salmon, Idaho, approximately 65 miles northeast of the Proposed Project Area. "Fine" particulate matter (PM 2.5; particles less than 2.5 micrometers in diameter such as those found in smoke and haze) was sampled every hour at this location for a 12-month period from October 2004 through September 2005. The data was averaged over monthly intervals and are displayed below in Table 3.1-1 (IDEQ 2006b). Although this station is located a significant distance from the quarry, the data are still somewhat representative and provide an understanding of the air quality characteristics, as the climate and vegetation are relatively similar at the Proposed Project Area.

Table 3.1-1. Average Monthly Particulate Matter (PM 2.5), Salmon, Idaho, October 2004 – September 2005.

Month	Average (PM2.5 ug/m^3)
OCT (2004)	5.25
NOV	10.37
DEC	12.56
JAN (2005)	15.35
FEB	17.10
MAR	9.32
APR	6.46
MAY	4.04
JUN	3.54
JUL	5.39
AUG	15.95
SEP	14.08

Note: Monthly data is the average (mean) calculated from hourly samples taken over a 12-month period using a Tapered-Element Oscillating Microbalance sampler.

Source: IDEQ 2006b

PM 2.5 in 2004 was relatively higher in the late summer and winter months. Particulate matter generated by wildfire and agricultural burning is generally greatest in the late summer. High particulate matter in the winter in Salmon may be attributed to inversion conditions that tend to promote stagnant air masses in valleys. This trend is not seen in the Challis area due to the low population. Data on “coarse” particulate matter (PM 10; particles larger than 2.5 micrometers and less than 10 micrometers in diameter) were measured in Salmon in a Hi-volume sampler from October 6 through December 29, 2004 (PM 10 are not available for a full year from this area). Measurements averaged 24.6 ug/m^3 over this time period.

All areas throughout the United States are assigned to one of three different classes of air quality protection. These are called Prevention of Significant Deterioration (PSD) Classes I, II, and III. Essentially, they help to insure that the air quality in clean air areas remains clean and does not deteriorate to the level of the National Ambient Air Quality Standards (NAAQS). The mechanism created by Congress to meet this goal is the establishment of “PSD increments.” These increments define the maximum allowable increases over baseline concentrations that are allowed in a clean air area for a particular pollutant. These increments are promulgated in the EPA PSD regulations at 40 CFR 52.21(c). Idaho has adopted these increments as state regulation in IDAPA 58.01.01.577.

In the 1977 Clean Air Act Amendments, Congress designated all international parks, national wilderness areas, and national memorial parks, which exceed 5,000 acres in size, and all national parks, which exceed 6,000 acres in size as mandatory PSD Class I areas. Class I areas are to receive special protection from degradation of air quality, and the most stringent PSD increments apply in these areas. The Class I areas closest to the Proposed Project area are the Frank Church River of No Return Wilderness located 21 miles to the west of the quarry, the Sawtooth National Recreation Area located 30 miles southwest of the quarry, and the Craters of the Moon National Monument, located 65 miles south of the proposed area. All of Custer County and the remainder of Idaho are designated as PSD Class II. PSD Class II areas are those that need reasonably or moderately good air quality protection. Most proposed development projects can be accommodated within the increments set for PSD Class II areas. There are no Class III areas in Idaho.

Pollution sources in the vicinity of the quarry site are generally non-point and temporary. Smoke haze may occur for a few days in the Challis area during the spring and summer months when forest or farmland fires are burning locally and during the winter when residents are using wood-burning stoves. Smoke haze may occur for a few days to several weeks when smoke from large forest or brush fires in Idaho, Montana, Nevada, or California is carried by prevailing winds into the Challis area. Dust pollution (PM 10) can be locally quite severe on more frequently traveled unpaved roads. Such dust pollution is rapidly dispersed by prevailing winds (USDI BLM 1998, p. 193). Wind-generated dust can also occur across the landscape, and can be especially dust-laden during the late summer and other dry periods, such as during drought. Dust pollution is also created by mining operations at the Three Rivers Stone Quarry and during high winds it is sometimes visible from areas inside and outside of the Proposed Project area. However, dust suppression is implemented on mining roads, pits, and other areas of surface disturbance, thus reducing the amount, spread, and duration of fugitive dust in the area.

3.1.2 Geology

The following section explains the geologic phenomena and defines geologic terms used for the flagstone excavated at the Three Rivers Stone quarry. This section also summarizes the previous geologic work in the immediate area, and then briefly discusses the rock exposed in Pit 1 at the quarry.

Background

In the area, much of the rock was initially deposited as sediment or once-living organisms, both of which accumulated on a sea floor during the Ordovician Period (about 570 to 460 million years ago; geologic ages from Palmer and Geissman 1999). Mineral-laden water then percolated through the open pore space of the sediment. The spaces gradually filled with minerals that precipitated from the water and eventually cemented ("lithified") the grains into horizontal layers of sedimentary rock. The individual layers are called beds, or, if quite thin, laminae. They are distinguished from each other by differences in grain size or lithologic (rock type) composition, such as the difference between shale (created from mud) and quartz sandstone (created from sand-size quartz grains). Horizontal beds are a type of sedimentary structure that is common in the rocks at the Three Rivers Stone quarry. Simple horizontal beds form in practically all sedimentary environments. They often represent rapid sediment deposition, usually by a single hydrodynamic event. Rocks in the quarry generally have a far less common sedimentary structure called ripples, the subparallel ridges and hollows formed by waves and currents. Ripples form from slight water turbulence in all types of sedimentary environments, but they are rarely preserved in sedimentary rock (Ashley 1990).

In the region, the Ordovician sedimentary rocks are partly covered by the Eocene Challis Volcanic rocks, which were deposited about 40 million years ago. The surface between the Ordovician sedimentary rocks and the Eocene volcanic rocks represents a gap in time of about 400 million years. In many places, the Ordovician and Eocene rocks are overlain by unlithified Quaternary alluvial deposits of variable thickness. These alluvial deposits are mostly pre-Pleistocene, Pleistocene, or Holocene stream deposits (Fisher and Johnson 1995).

Personnel at L&W Stone refer to rock excavated at the quarry as flagstone, shale, argillite, and quartzite. Flagstone is a generic term for any stratified stone that splits into pieces that are suitable for use as paving stones. Like a “flag”, a flagstone is much thinner than it is wide or long. The Three Rivers flagstone is quarried from argillite layers and hand-split into individual slabs ranging in thickness from less than 1 inch to about 5 inches, and ranging in length-to-width from less than 1 foot by 1 foot to 5 feet by 8 feet.

The “shale” at the quarry is a silicified mudrock. Shale is a type of mudrock. Mudrock (or mudstone) refers to all silica-rich clastic sedimentary rocks composed predominantly of silt-size or clay-size particles regardless of their mineral composition. Mud-size particles are generally too small to be distinguished without a microscope. A mudrock composed mostly of silt is called a siltstone, while a mudrock composed mostly of clay is called a claystone. Shale is any mudrock that exhibits the ability to split along very thin layers. This property is called fissility. Fissility is caused by the alignment of the plate-like clay minerals that form parallel layering once the clay-rich mud becomes compacted. The lack of fissility or layering in mudstone may be due either to original texture, or to the disruption of the original texture by organisms burrowing in the sediment prior to lithification.

Following deposition and lithification, the sedimentary rock at the quarry was subjected to pressure, heat, and chemically-active fluids in a process called metamorphism. Metamorphism permanently altered the sedimentary rock at the quarry. Argillite and slate are mudrocks that were subjected to low-grade metamorphism. Both will "ring" when struck by a hammer, whereas shale will "thud" from a hammer blow. Slate, like shale, can be split along planes, but thin pieces of slate are not nearly as crumbly as shale. Slate is defined by its hardness, and by possessing slaty cleavage. Slaty cleavage is created by increased pressure and temperature during metamorphism, which aligns and recrystallizes the platey clay minerals into parallel layering along which the rock readily splits. At the quarry, slaty cleavage is parallel to horizontal beds and laminae. It is the physical property of the flagstone that allows it to be cleaved into thin plates or sheets. Argillite is sometimes considered intermediate between shale and slate because argillite does not possess true slaty cleavage.

The term "quartzite" historically has been applied to all rocks in the quarry area that consist of sand-size grains of quartz that have been lithified by quartz cement. In modern geologic usage, quartz-cemented quartz-rich sand would be called quartz sandstone. Quartz sandstone could also contain minor amounts of other mineral grains, such as feldspar. The term "quartzite" should be reserved for metamorphosed quartz-rich sandstone. A field determination between a sandstone and quartzite can be made by observing if a hammer blow fractures the rock around individual sand grains (a sandstone) or through some or all of the individual grains (a quartzite). At the quarry, the quartzite consists of both quartz sandstone, quartzitic sandstone, and quartzite.

Geologists commonly refer to a vertical stack of beds and laminae as sedimentary strata. Strata and other rocks with distinctive characteristics that cover a large area are called geologic formations. A formation is the fundamental unit in rock stratigraphic classification. It is a body of rock characterized by lithologic similarity; it is generally tabular and mappable at the earth's surface or traceable in the subsurface (ACSN 1961). Geologists map and describe a formation in an area where it is well exposed. Typically, the formation is assigned a name based on the area where it is well exposed. At the Three Rivers Stone quarry, the two Paleozoic formations are:

- The Clayton Mine Quartzite, deposited during the Ordovician Period (438 to 505 million years ago); and
- The Ramshorn Slate, also deposited during the Ordovician Period, but before the Clayton Mine Quartzite (Hobbs and Hays 1990; geologic ages from Palmer and Geissman 1999).

During and following metamorphism, these and other Paleozoic formations in the area were also compressed and fractured. During compression, the strata responded in both a ductile ("bendable") and brittle fashion. The compressing of the strata created folds called anticlines and synclines. Anticlines are upward-curving (convex) folds that resemble an arch. The central part contains the oldest rock formation. Synclines are downward-curving (concave) folds that resemble a "U". The central part contains the youngest rock formation. An anticline and adjacent syncline share a common limb between the crest of the anticline and the trough of the syncline. The major "megascopic" folds in the Three Rivers Stone quarry area are huge: the horizontal distance between the crest of one anticline and the trough of its adjacent syncline is about 2,000 to 4,000 feet (as measured from the geologic map[1] of Hobbs *et al.* 1991).

During brittle-type folding, fractures develop in fine-grained rock. Certain fractures develop perpendicular to the compression direction that creates anticlines and synclines. These fractures are called axial plane cleavage. At Pit 1 in the quarry, axial plane cleavage in the argillite flagstone is essentially perpendicular to sub-perpendicular to bedding. The axial plane cleavage, the slaty cleavage, and the bedding surfaces allow the argillite to cleave into individual slabs of marketable flagstone.

Also during folding, some strata were broken (faulted) by compression. Some layers were forced on top of adjacent layers. These faults are called thrust faults, which are low-angle reverse faults that emplace older rocks on top of younger rocks. Later, the entire region was pulled apart, and the rocks once again were faulted. These "extensional" or "normal" faults caused large blocks of rock to move downward relative to adjacent blocks of rocks.

Previous Geological Work

Interest in the geology of the area began with the discovery of mineral deposits in the Bayhorse mining district, located about 10 miles to the north of the Three Rivers Stone quarry. The first comprehensive work on the Bayhorse area was by Ross (1937) who described the general rock types and mapped the geology in a reconnaissance fashion. Rocks at the quarry were mapped by Ross (1937) as Ordovician Kinnikinic Quartzite. Hobbs *et al.* (1991) mapped the quarry and surrounding area. They produced a geologic map at a scale of 1:62,500 (1 inch on the map equals about 1 mile on the ground) which shows two geologic formations in the quarry area: the Ordovician Ramshorn Slate, and the Ordovician Clayton

[1]Geologic maps graphically communicate vast amounts of geologic information. A geologic map represents the projection on a flat piece of paper of the intersection between geological three-dimensional features with the surface topography. In addition, geologic maps depict the relative age, composition, and relationships among rocks and sediments at and near the earth's surface. Geologic maps normally include cross sections or block diagrams that reveal the structure or arrangement of rocks below the Earth's surface. Such diagrams give map users a glimpse below the ground surface and a better understanding of the three-dimensional arrangement of the rocks (Powell 1992).

Mine Quartzite, along with thrust faults and folds. On their geologic map, many of the contacts between the Ordovician formations are shown as thrust faults. However, the thrust faults mapped by Hobbs *et al.* (1991) emplace younger rocks on older rocks. The geologic map by Hobbs *et al.* (1991) also shows that Ordovician strata are folded; the largest fold is named the Bayhorse anticline. The trace of its axial surface (the plane that cuts the fold in half) is located about 2 miles west of the quarry. From west to east, strata in the quarry dip steeply east, then flatten out, then dip west, and then back to the east, forming a series of synclines and anticlines along the east limb of the megascopic Bayhorse anticline. At the quarry, the geologic map (Hobbs *et al.* 1991) shows the Ordovician Clayton Mine Quartzite to be in depositional contact with the older Ordovician Ramshorn Slate, but the Clayton Mine Quartzite dips under the Ramshorn Slate. No additional geologic mapping has occurred in the quarry area. Later publications (Fisher and Johnson 1995) simply compiled and generalized this earlier work.

In a companion paper to the geologic map, Hobbs and Hays (1990) described the Ordovician and older rocks of the Bayhorse area, and attempted an interpretation of the temporal and stratigraphic relations between these geologic formations. About 1.2 miles east, northeast of the quarry, they described a generalized composite columnar stratigraphic section of the Ordovician Clayton Mine Quartzite. Hobbs and Hays (1990) described the Ordovician Ramshorn Slate by essentially paraphrasing the work of Ross (1937). Both of these Ordovician formations contain rock types that are similar to the quartzite, shale, and argillite exposed in Pit 1 of the quarry. Pit 2 also contains lithologically similar rocks, but their geometric and structural relationship to similar rocks in Pit 1 is not known.

Geology Exposed in Pit 1

Pit 1 provides a superb exposure of the flagstone argillite, shale, and quartzite (Figure 3.1-1). In Pit 1, these strata essentially strike to the north and dip steeply to the east and compose part of the east limb of the megascopic Bayhorse anticline. Along the south wall of Pit 1, the argillite and shale dip an average of 50 degrees to the east. The upper portion of the shale dips about 30 degrees to the east, and the quartzite dips about 20 degrees to the east. The following short description is based on rock exposed along the south wall of Pit 1 and from rock exposed in the cut slope of the quarry road by the fuel storage area. The stratigraphic succession consists of argillite overlain by shale, which is overlain by quartzite. The short rock description includes field descriptions to estimated rock strength of the shale and argillite as defined by Santi (2006). The rock descriptions are followed by a summary of rock and soil samples taken in the quarry area that were geochemically analyzed to determine the abundance of a limited number of metals.

Figure 3.1-1. Flagstone Argillite, Shale, and Quartzite Exposure in Pit 1.

<u>Flagstone Argillite</u>

The color of the argillite, based on a rock color chart, is purple-grey to reddish-purple to grayish-green, with minor light brown-to-buff colors (Goddard and others 1948) (Figure 3.1-2). Rare exposures of the purple argillite show green ellipses. Bedding is generally thickly laminated to thinly bedded. Ripple forms, where preserved, include both symmetric and asymmetric geometries (Figure 3.1-3). The argillite contains poorly-developed slaty cleavage that is essentially parallel to bed forms, and a well-developed cleavage that is perpendicular to sub-perpendicular to bed forms. Based on limited field work, this cleavage may be axial plane cleavage created during the folding. The rock outcrop mostly "rings" when struck by hammer blows. The flagstone argillite has a Weathering Grade of I to II (fresh to slightly decomposed), a Corestone Strength of 1, a Strength Value of 9 to 10, a Discontinuity Value of 0 to 2, and a Jar Slake Value of 6.

Figure 3.1-2. Flagstone Argillite in Pit 1.

Figure 3.1-3. Flagstone Argillite with Ripple Formations in Pit 1.

<u>Shale (Siliceous Mudstone)</u>

The "shale" is more appropriately called a siliceous mudstone. It is generally purple-grey and faintly to distinctly laminated to thinly-bedded, and has a strong slaty cleavage. Bed surfaces show gold-colored sericite (recrystallized biotite). Some bed surfaces show bed-parallel shear. The rock outcrop mostly "thuds" when struck by hammer blows. The siliceous mudstone has a Weathering Grade of II (slightly decomposed), a Corestone Strength of 2, a Strength Value of 8 to 9, a Discontinuity Value of 1 to 3, and a Jar Slake Value of 5.

Quartzite

The quartzite exposed adjacent to the quarry fuel storage area is fine-to-course grain quartz-cemented quartz sandstone to quartzite, with rare grains of feldspar. The quartzite is light grey to light pink, and weathers to a light yellowish-orange. It is generally medium-bedded to very thickly bedded.

Geochemistry of Rock and Soil

Mines may generate highly acidic discharges if sulfide-rich rock is processed. Sulfide-rich rock can produce sulfuric acid when exposed to oxygen and water. However, it is not the acid that is of environmental concern, but the metals that are dissolved from the rock by the acidic water. The BLM determined that the waste rock at the Three Rivers Stone Quarry contains no visible sulfide minerals, and only trace amounts of oxidized iron minerals (Gardner 2006). In addition, there is no visible evidence of acidic drainage from the waste rock, such as dead vegetation, color stains, or sulfurous odors (Gardner 2006). Consequently, the waste rock cannot produce acid-rock drainage.

The BLM also evaluated the waste rock at the quarry for elevated levels of specific metals that may be of environmental concern. For evaluating mining activities on public land, the BLM developed Risk Management Criteria (RMC) for specific metals of concern in soil, sediment, and water (Ford 1996; 1998). The concept behind the RMC is that people and wildlife will not experience adverse health effects from metal contamination on BLM-administered lands if exposure is limited to soil, sediment, and water with concentrations at or less than the specific RMC (Ford 1996).

As a first screen, the BLM took two composite samples in April 2006 from each of the three rock types for laboratory analysis of arsenic (As), cadmium (Cd), copper (Cu), selenium (Se), and zinc (Zn). These six samples were taken from quarry waste rock piles and analyzed by inductively coupled plasma-atomic emission spectrometry (ICP-AES).

Additional sampling was then performed in November 2006 to assess potential human and ecological risk associated with excavating rock at the quarry. Argillite, shale, and quartzite were sampled from fresh outcrop. Each sample (Rock A, Rock M, Rock Q) was a composite of 20 to 50 chips of rock taken along a stratigraphic profile. In addition, very fine particles of rock ("soil") were sampled from fractures and bedding surfaces within the argillite (Soil A), shale (Soil M), and quartzite (Soil Q). A composite soil sample was taken from the floor of

Pit 1 (Soil PF). The soil sample consisted of finely crushed rock particles that typically cover the pit floor. Finally, two "background" samples were taken from undisturbed areas where soil supporting vegetation had developed on rock (Soil 1, Soil 2).

All of the samples collected in November were analyzed for As, Cd, Cu, and Zn by ICP-AES. In addition, the six soil samples were analyzed for selenium using hydride generation atomic absorption spectrometry (Hydride-AA). This procedure provides lower analytical detection limits for selenium than previously used during the first screening.

Table 3.1-2 shows all of the laboratory analytical results and compares the results from the soil to the BLM RMC for human and ecological risk from soil. The exposure scenarios for soil are empirically determined based on inhalation of dust and ingestion of soil (Ford 1996). The initial screening samples from waste rock (sample ID LW-2006-0X) and from Pit 1 rock (URS-06-A, -M, -Q) are not comparable to soil RMC values. However, all but one rock sample showed low levels of analyzed metals. One shale waste rock sample (LW-2006-05) recorded cadmium at 113 milligrams per kilogram (mg/Kg). However, the Pit 1 rock "chip" sample from shale (URS-06-M) and Pit 1 soil sample from shale (URS-06-Soil M) both had cadmium concentrations below laboratory detection limits (less than 0.20 mg/Kg).

For soil, Ford (1996; 1998) advised using the following guidelines to assess the potential human and ecological risk:

- Less than or equal to the soil constituent value: low risk;
- One to ten times soil constituent value: moderate risk;
- Ten to 100 times the soil constituent value: high risk; and
- Greater than 100 times the soil constituent value: extremely high risk.

Soil samples showed low or no human risk from arsenic, cadmium, copper, selenium, and zinc. Both selenium and zinc represented a low or no risk to wildlife. Five of six waste rock samples showed values for arsenic below laboratory detection limits (Table 3.1-2). Therefore, soil samples were not analyzed for arsenic. Pit 1 soil samples for cadmium were all below laboratory detection limits, while both background soil samples registered low cadmium values. One background soil sample (URS-06-02) contained cadmium at a level that represents a moderate risk to American robins (*Turdus migratorius*) (Ford 1998). Six of seven soil samples, including disturbed and undisturbed sample points, contained copper at levels that represent a moderate risk to American robins (Ford 1998). It should be noted that elevated metal concentrations in rock pose far less risk than those in soil because the metals are encapsulated in the rock.

Table 3.1-2. Summary of Laboratory Analytical Data from the Three Rivers Stone Quarry. NA = Not Analyzed.

MINE	LOCATION	SAMPLE ID	Arsenic (mg/Kg)	Cadmium (mg/Kg)	Copper (mg/Kg)	Selenium (mg/Kg)	Zinc (mg/Kg)
BACKGROUND SOIL	East of Pit 1	URS-06- Soil 1	NA	0.22	9.4	0.110	NA
	Southeast of Pit 1	URS-06- Soil 2	NA	0.4	19.7	0.119	NA
WASTE ROCK	Argillite	LW-2006-01	4.6	0.41	5.7	<4.0	6.6
	Argillite	LW-2006-04	<2.5	15.8	10.3	<4.0	4.9
	Shale	LW-2006-02	<2.5	113	3.6	<4.0	5.1
	Shale	LW-2006-05	<2.5	0.21	7.8	<4.0	4.2
	Quartzite	LW-2006-03	<2.5	<0.20	3.7	<4.0	2.2
	Quartzite	LW-2006-06	<2.5	18.2	6.4	<4.0	1.4
PIT 1 ROCK	Argillite	URS-06-A	NA	<0.20	4.1	NA	NA
	Shale	URS-06-M	NA	<0.20	1.2	NA	NA
	Quartzite	URS-06-Q	NA	<0.20	2.8	NA	NA
PIT 1 SOIL	Argillite Soil From Fractures	URS-06-Soil A	NA	<0.20	32.4	0.109	NA
	Argillite Soil From Fractures (duplicate)	URS-06-Soil X	NA	<0.20	33.1	NA	NA
	Shale Soil From Fractures	URS-06-Soil M	NA	<0.20	7.3	<0.100	NA
	Quartzite Soil From Fractures	URS-06-Soil Q	NA	<0.20	6.1	<0.100	NA
	Soil From Pit Floor	URS-06-Soil PF	NA	<0.20	19.9	<0.100	NA
RISK MANAGEMENT CRITERIA*	Ford 1996	Worker	12	100	7,400	2,000	60,000
		Camper	20	70	5,000	1,000	40,000
		ATV Driver	300	950	70,000	1,000	550,000
	Ford 1998	American Robin	4	0.3	7	6	43
		Deer Mouse	230	7.0	640	142	419
		Mule Deer	200	3	102	106	222

*Risk Management Criteria: One to 10 times the constituent value = moderate risk; 10-100 times = high risk; >100 times = extremely high risk.

The chemical analyses of samples of soil and rock from both the quarry and background sites demonstrate that the mining operations do not cause increased exposure to metals to humans or wildlife relative to the natural levels of metals in the environment. This is to be expected because the rock in the quarry area is not highly mineralized. For comparison, similar rock types at the Thompson Creek Tungsten Mine in Custer County are highly mineralized; this has resulted in elevated levels of metals in soil, in mine waste dumps, and in stream sediments (Van Gosen *et al.* 2000).

3.1.3 Minerals (Leaseable, Locatable, Saleable)

The Federal Government recognizes three categories of minerals: locatable, leasable, and saleable. Locatable minerals are appropriated under the General Mining Laws of 1872. Leasable commodities comprise minerals such as oil, gas, coal and phosphate that may be obtained from the United States only by lease. Saleable minerals are disposed under the Mineral Material Act of 1947 and the Multiple Surface Use Act of 1955. These minerals include common varieties of sand, stone, gravel, and clay. The flagstone mined at the quarry is considered to be a locatable mineral by the BLM. All other rock at the quarry is considered to be saleable.

The BLM determined that the argillite flagstone mined at the L&W Stone quarry is an uncommon variety of building stone with a unique combination of physical properties such as cleavability, hardness, strength, durability, low absorption rate, greater density, stain and abrasion resistance, and unusual intermixing of colors and surface textures. Therefore, the argillite is a rock deposit locatable under the General Mining Law of 1872 (Lewis and Gardner 2004). Other rock in the quarry area contains no known deposits of locatable, leasable, or saleable mineral resources. The site geology indicates little probability of discovering other mineral deposits at the quarry area. To date, approximately 200,000 tons of argillite flagstone have been removed from the quarry.

3.1.4 Soils

The quarry area contains rock outcrops and bedrock-derived soils. The rock outcrops are classified as the Calcids-Rubble land-Rock outcrop complex. The soil types are classified as the: Kehar series, Millhi series, Pedoli-Whiteknob complex, and Venum series. All four soil types are neutral to strongly alkaline (USDA-NRCS 2006). Figure 3.1-4 shows the soil types mapped by the Natural Resources Conservation Service (USDA-NRCS 2006) in and adjacent to the Proposed Project Area.

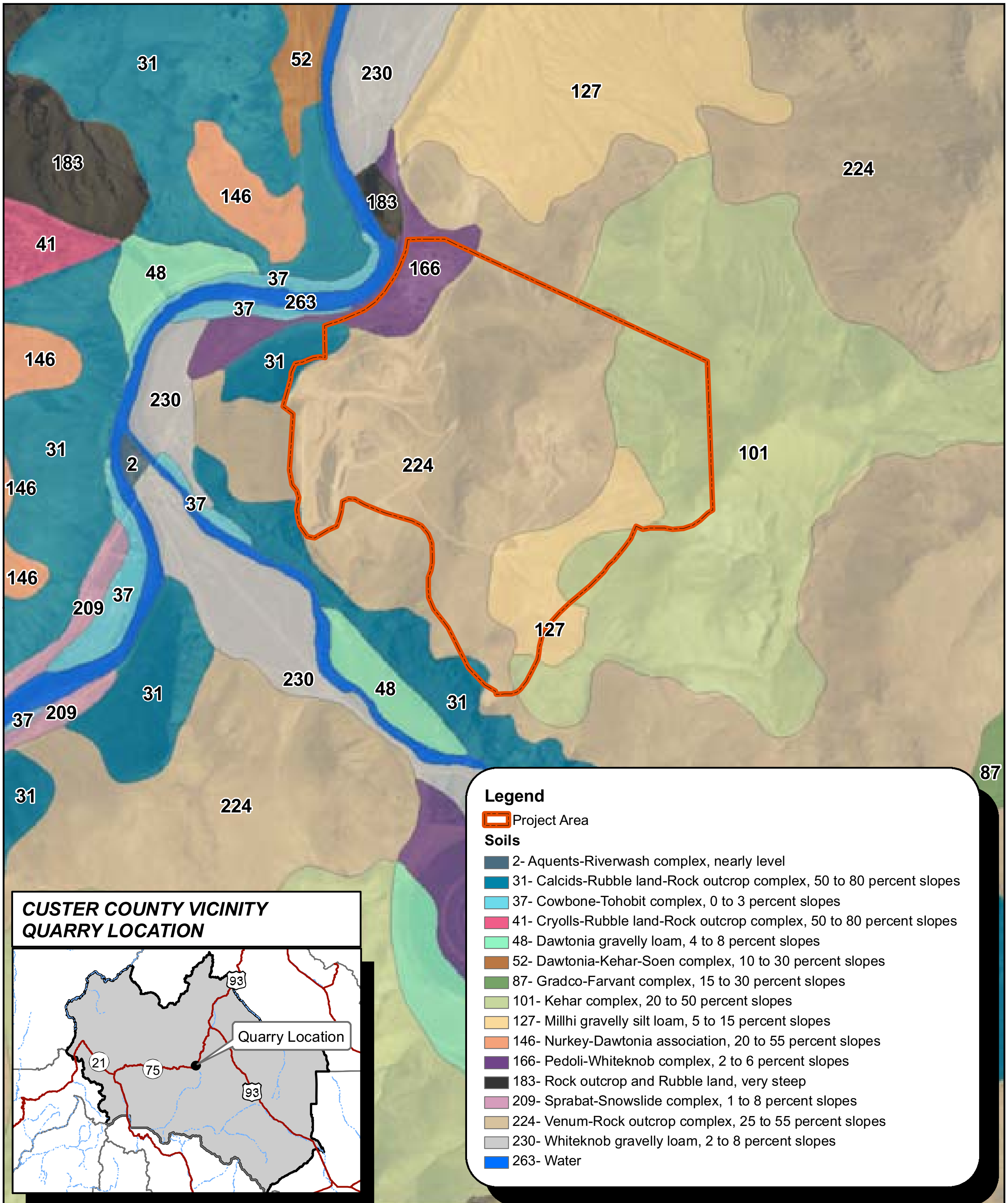

Figure 3.1-4. Soils Map

N W E S

0 375 750 1,500 2,250 3,000 Feet

1:17,500

Three Rivers Stone Quarry
L & W Stone

The soils at the quarry area may be erodible due to sparse vegetation, fine soil particle size (abundant silt and clay), and generally low soil moisture content. Generally, the fine-textured soils on site are located where slope gradients are less than 10 percent. Soil thickness in most of the quarry area is less than 6 inches, with rock (no soil) exposed in many areas. Some topographic depressions may contain thicker soils.

3.1.5 Hazardous Substances and Petroleum Products

No acutely hazardous waste or "listed wastes" as defined by the EPA are used or stored at the project site. Chemicals and petroleum products stored on site include antifreeze, brake fluid, radiator flushing fluids, hydraulic fluid, fuel de-icing additives, degreasing solvents, packaging material from explosives, ammonium nitrate, fuel oil, premixed ammonium nitrate fuel oil (ANFO), diesel fuel and fuel. Quantities stored on site are relatively small, with the exception of diesel fuel. Mobile equipment is serviced onsite by an equipment maintenance company. This includes oil changes and lubrication. Used oils and other fluids are temporarily stored onsite and then disposed offsite in compliance with State and Federal environmental requirements (40 CFR 239-374; IDAPA 58.01.05.000 *et seq.*). The size and location of storage tanks are described in Section 2.1, Historical and Current Operations.

3.1.6 Water Quality

Current Conditions

The Proposed Project Area straddles a ridge that drains north to the Bradshaw Basin Subwatershed[2] and south to the Main (Lower) East Fork Subwatershed, which both drain to the Upper Salmon Subbasin[3]. The Proposed Project Area drains directly toward the mainstem Salmon River and East Fork Salmon River (Figure 3.1-5). Water quality has been an issue of concern in the Upper Salmon River Subbasin. Water quality has been degraded cumulatively by historic management and land uses such as mining, warm-season grazing, over-utilization of riparian areas by grazing, timber harvest and associated roads, and recreational development (IDEQ 2003).

[2] subwatershed = sixth field level of division in the hydrologic unit code (HUC) system

[3] subbasin = fourth field level of division in the HUC system