4.3.3 POTENTIAL FOR INCREASED INFILTRATION TO GROUNDWATER THROUGH THE PITS

The open pits are not expected to penetrate the groundwater table, and no pumping for dewatering would be required. There may be a potential for increased recharge to the groundwater system, however, because the pits would mine through permafrost that currently restricts infiltration of precipitation. Based on the vegetative types covering the pit area, approximately 65 acres, or 47 percent of the pit area, are underlain by some permafrost.

Potential infiltration through the pits to groundwater has been estimated based on the following assumptions:

- The total area encompassing both the Hindenburg and East pits is approximately 138 acres, or 6,000,000 ft^2
- The long-term average precipitation in the project area is approximately 15 in/yr, or 1.25 ft/yr.
- A total of 7,500,000 ft^3/yr of precipitation fall on the pit area.
- Of this amount, a large percentage would be lost to evaporation before it could run off to lower benches within the pit. It is estimated, based on experience at other sites, that a maximum of 40 percent of the total precipitation would reach the lower benches, or approximately 3,000,000 ft^3/yr.
- Of this amount, a large percentage would evaporate or be pumped out of the pits using sumps. It is estimated that a maximum of 5 percent of this water might be available for infiltration. Therefore, a maximum estimate of potential infiltration through the pit is 150,000 ft^3/yr, or approximately 2.1 gpm.

The estimate of 2.1 gpm represents a reasonable estimate based on conservative assumptions. As noted in Section 3.6.2, the estimated flow-through of the system may be as high as 500 gpm, including recharge currently derived from the portions of the pit that are not underlain by permafrost. Therefore, the estimate of 2.1 gpm likely represents a minimal additional input to the flow system. There likely would be no impact on the overall groundwater flow system given this slight increase in potential flow from increased recharge.

4.4 WATER QUALITY

Based on the acid/base accounting analysis discussed in Section 3.7.3 (Acid Generating Potential), precipitation and the isolated inflows that would contact the exposed rock in the pit walls are not expected to generate acid. The chemical composition of waters recharging the groundwater system from the pits, therefore, is not expected to be any different than the current groundwater chemistry. Thus, no significant chemical impact to groundwater is expected at the site from the potentially increased infiltration through the open pits. Therefore, within the context of the Dome Creek and Little Eldorado Creek drainages, the hydrologic systems within which the mine site is situated, there would be no significant impacts.

4.5 VEGETATION AND WETLANDS

4.5.1 VEGETATION

In this section, vegetation impacts in the mine area are discussed in the context of the whole Dome and Little Eldorado creek drainages because they constitutes the unit encompassing the water, air, soil, and elevation factors that affect vegetative communities. For the access haul road, impacts are discussed in the context of the whole Pedro Creek drainage for the same reason. In these contexts, no significant impacts on plant communities would result from project development.

Table 4.5-1 shows the acreage, by individual vegetation type, that would be disturbed by developing the True North project, excluding the access haul road to the Fort Knox Mill. The community types are the same as described in Section 3.8 (Vegetation).

Table 4.5-1
Approximate area of disturbance to vegetation types expected from development of the True North project, *excluding* the access haul road to the Fort Knox Mill

Physiography	Vegetation Type		Area	
	Level 1	Levels 2–3	Hectares	Acres
Upland	Forest	Needleleaf-closed	9.2	23.3
		Needleleaf-open	31.6	83.6
		Broadleaf-closed	13.4	33.4
		Broadleaf-open	0.3	• 0.5
		Mixed-closed	4.7	11.7
		Mixed-open	4.2	8.5
	Scrub	Tall-open	29.7	74.6
Lowland	Forest	Needleleaf-closed	1.1	3.6
Human Disturbed			2.2	• 5.4
Total Area			96.4	244.7

Source: ABR, 2000b

Approximately 64 percent of the disturbance would occur to two vegetation types – upland needle-leaf open forest 33 percent) and upland scrub tall-open (31 percent). Only one other vegetation type, upland broadleaf-closed forest (14 percent) would account for more than 10 percent of the total disturbed area. Disturbance to these community types would not be significant because they are very common in the project area (Dome and Little Eldorado creek drainages) and throughout the upper Chatanika

River drainage as well as throughout interior Alaska, and the intensity of the impacts would be very small within this context. After the project and reclamation were complete, a major part of the disturbed area is expected to revegetate to these three plant community types, though probably not in the same percentages. Approximation of suitable conditions to encourage vegetation reestablishment on these sites, including soil compaction and soil moisture, would be an important consideration of the reclamation plan.

Approximately 69.4 acres of vegetation would be disturbed along the proposed access haul road alignment, primarily open black spruce forest and black spruce woodlands, but also an open canopy of tall deciduous shrubs and open deciduous forest of aspen in small isolated patches. Disturbance to these community types would not be significant because they are very common in the Pedro Creek drainage and throughout the Goldstream drainage as well as throughout interior Alaska, and the intensity of the impacts would be very small within this context.

4.5.2 WETLANDS

Wetland impacts associated with development of the True North project would include clearing, excavating, and filling forested and scrub-shrub wetlands. Filling activities would include both temporary fills for access roads and permanent fills, including the open pits, development rock and growth medium stockpiles, the maintenance complex, and mine and access haul roads.

During implementation of the True North project, mitigation actions would be taken to avoid and minimize impacts to existing wetlands. Avoidance measures, such as locating facilities and the access haul road outside wetlands where possible, have already been taken in site planning. During project development, sediment-control measures such as the use of hay bales, silt fences, and sediment traps around earth-moving activities and stockpiles would be implemented where surface runoff would flow into otherwise unaffected wetlands. Other measures are listed in Section 2.3.21 (Mitigation).

In this section, wetlands impacts on the mine area are discussed in the context of the whole Dome and Little Eldorado creek drainages because they constitutes the unit encompassing the water, air, soil, and elevation factors that affect wetland communities. For the access haul road, impacts are discussed in the context of the whole Pedro Creek drainage for the same reason. In these contexts, no significant impacts on wetland communities would result from project development.

4.5.2.1. MINE AREA

Table 4.5-2 shows the acreage, by wetland type, that would be disturbed by developing the True North project, *excluding* the access haul road to the Fort Knox Mill. Approximately 65.8 acres of wetlands would be affected by project development. The wetland types are the same as described in Section 3.9 (Wetlands).

Table 4.5-2
Approximate area of disturbance to wetland types expected from development of the True North project, *excluding* the access haul road to the Fort Knox Mill

		Area	
Wetland Type	**NWI Code**	**Hectares**	**Acres**
Dwarf Black Spruce Woodland/ Ericaceous Shrub	PSS 4/3 B	9.8	24.1
	PSS 4 B	0.6	1.5
Black Spruce Forest/Scrub Shrub	PFO/SS 4 B	8.6	21.4
	PFO4/SS 1 B	7.6	18.8
Subtotal: Wetlands Area		26.6	65.8
Subtotal: Uplands	U	72.4	178.9
Total Area		99.0	244.7

Source: ABR, 2000b

Approximately 73 percent of disturbance (179 acres) would occur on uplands. Of the 27 percent of disturbance (66 acres) that would occur on wetlands, approximately 64 percent would occur in the black spruce forest/scrub shrub wetland type (two National wetland Inventory [NWI] classes: PFO/SS 4 B and PFO4/SS 1 B). The remaining approximately 36 percent would occur in the dwarf black spruce woodland/ericaceous shrub (PSS 3/4 B and PSS 4B) wetland type. Disturbance to these community types would not be significant because they are very common in the project area (Dome and Little Eldorado creek drainages) and throughout the upper Chatanika River drainage as well as throughout interior Alaska, and the intensity of the impacts would be very small within this context. For example, disturbance to the black spruce forest/scrub shrub wetland type would only amount to approximately 2.5 percent of the area of that type found just within the True North claims block. Disturbance to the dwarf black spruce woodland/ericaceous shrub wetland type would amount to less than 1 percent of the area of that type found just within the True North claims block. Also, these wetland types are generally considered low value wetlands. High value wetlands such as emergent marsh, riparian habitats, or open water are not found in the area that would be disturbed by development of this deposit.

4.5.2.2. ACCESS HAUL ROAD

Table 4.5-3 shows the acreage, by wetland type, that would be disturbed by construction of the access haul road to the Fort Knox Mill. Approximately 11.8 acres of wetlands would be disturbed. The wetland types are the same as described in Section 3.9 (Wetlands).

Most of the proposed road alignment, 82 percent, is situated in upland areas (Table 4.5-3). Wetland areas that would be disturbed by the access haul road total approximately 11.8 acres (17 percent) of the potentially disturbed area of 69.4 acres. Disturbance to these wetlands types would not be significant because they are very common in the Pedro Creek drainage and throughout the Goldstream drainage as well as throughout interior Alaska. Also, these wetland types are generally considered low value wetlands. High value wetlands such as emergent marsh, riparian habitats, or open water are not found in the area that would be crossed by the access haul road.

Table 4.5-3

Approximate lengths and areas of wetlands and uplands that would be disturbed by construction of the proposed access haul road to the Fort Knox Mill

		Length		Area	
Wetland Type	**NWI Code**	**(km)**	**(mi)**	**(ha)**	**(acres)**
Open tall alder shrub	PSS/EM1B	0.1	0.1	0.4	1.1
Black spruce woodland	PFO4/EM1B	<0.1	<0.1	0.1	0.3
Open tall birch shrub	PSS3/1B	0.1	0.1	0.3	0.7
Open dwarf black spruce forest	PSS3/4B	0.1	0.1	0.3	0.7
Black spruce woodland	PFO4/SS1B	0.6	1.0	3.3	8.1
Open black spruce forest	PFO4B	<0.1	<0.1	0.1	0.3
Upland/black spruce woodland	U/PFO4/SS1B	<0.1	0.1	0.2	0.6
	Wetlands Subtotal	1.6	1.0	4.8	11.8
Upland	U	7.6	4.7	23.3	57.5
	Project Total	9.2	5.7	28.1	69.4

Source: ABR, 2000a

4.6 FISH

In this section, fish impacts are discussed in the context of the fish and fish habitat in the Dome and Little Eldorado creek drainages (approximately 30 square miles) because these drainages constitute the hydrological unit whose functions affect the fish populations and habitats. In this context, no significant impacts on fish or fish habitat would result from project development. For the access haul road, impacts are discussed in the context of the whole Pedro Creek drainage for the same reason. In these contexts, no significant impacts on fish communities would result from project development.

The location of project operations and disturbance are at a sufficient distance from creeks within the project area that no significant impacts to water quality or flow volumes are expected. Excavation of the mine pits would have no direct impact on creeks. The possibility of a slight increase in groundwater recharge through the open pits might result in a slight increase in groundwater discharge flows to the creeks, but this would be very small in intensity and not be significant (WMCI, 2000). Planned placement of rock and growth medium stockpiles to avoid impacting surface waters, combined with erosion prevention measures, should prevent runoff impacts to creeks.

The access haul road would traverse areas high in the drainages and would cross only small streams. Because of the very small volume of water in the streams that would be crossed, there are no fish in them at those locations. Adequate sizing of culverts to pass natural flows as well as storm runoff would allow water to flow unimpeded to lower reaches that might support fish populations. Proper ditching and stabilization of cut banks and road fill would minimize erosion.

4.7 WILDLIFE

In this section, mine site wildlife impacts are discussed in the context of the wildlife populations and habitat in the Dome and Little Eldorado creek drainages (approximately 30 square miles) and, where the home range of a species is large, adjacent drainages. For the access haul road, impacts are discussed in the context of the whole Pedro Creek drainage for the same reason. In these contexts, wildlife would not be significantly impacted by project development because the habitat types are common in these drainages and throughout the Interior, the affected species are widespread in distribution, or the home range of a species is large when compared to the area that would be impacted.

Three types of wildlife impacts, primarily short-term, would occur from developing and operating the True North project: (1) direct habitat loss, (2) indirect habitat loss (the effective loss of habitat through avoidance because of human contact and associated mining activities and noise), and (3) effects on animal movements (by directly or indirectly altering traditional movement patterns).

The project components, primarily the pits, associated storage piles, and the maintenance complex, would disturb approximately 245 acres. This would constitute approximately 0.02 percent of the Dome and Little Eldorado creek drainages, with the large majority representing direct habitat loss to wildlife during the project's life. An additional approximately 69 acres would be disturbed to construct the access haul road, the large majority of which would be in a different drainage. Some indirect habitat loss would occur during project operation when the effects of noise, movement of equipment, and general human activities cause some animals to simply leave or avoid surrounding areas. The size and nature of some project components (the open pits, storage piles, and maintenance complex) also would interfere with traditional movement patterns of some species.

After mine closure, the direct loss of some terrestrial habitat likely would become permanent (for example, at the mine pit) for some species. This may be minimized by reclamation. Other areas of direct habitat loss caused by mining operations (such as rock stockpiles) likely would become usable habitat after they were reclaimed. Indirect habitat loss, resulting from avoidance of mining and related human activities, would end. Effects on traditional movement patterns of some species could continue because of the permanent presence of the mine pits. None of the operational or post-closure effects, however, would be significant in the context of the overall Dome and Little Eldorado creek drainages because the affected species and habitats are common and widespread in distribution, or because the affected area is a small part of a species' home range.

4.7.1 BIRDS

Direct habitat loss would occur to passerine species whose small territories and home ranges fall within the project's disturbance footprint. This loss would not be significant, however, because the type of habitat that would be lost is common in the Dome and Little Eldorado creek drainages and throughout the Interior, and the species affected are also widespread. Indirect habitat loss for these species would be negligible because they would adapt to life adjacent to the facilities.

Aside from the Northern Goshawk, discussed in Section 4.8 below, no raptor nests were found during surveys in the True North project area. A few other raptors, however, might be displaced from nesting habitat by direct or indirect habitat loss. It is reasonable to assume that excavating the mine pits would cause some direct habitat loss, or desertion of a nest due to indirect habitat loss. Such losses would be significant only on a local basis because only a few such nests likely would be affected, the individuals might find another nest site in nearby habitat, and these raptor species are common throughout the Interior.

4.7.2 MAMMALS

Direct habitat loss would occur to small mammals whose territories and home ranges fall within the project's disturbance footprint. This loss would not be significant, however, because similar habitat is common in the Dome and Little Eldorado creek drainages and throughout the Interior, as are the species that would be affected. Indirect habitat loss for most species of small mammals would be small because they would adapt to the presence of the facilities. Marten, however, have a low tolerance for human activities and indirect habitat loss for this species likely would occur in the upper Dome and Little Eldorado creek drainages. This would not be significant in the context of the overall Dome and Little Eldorado creek drainages and adjacent drainages throughout which marten are found.

For moose, project development would cause the loss of some upland habitat, but almost no winter habitat would be lost because there would be little disturbance in creek bottoms or floodplains. This habitat loss would be small and not significant in the context of the Dome and Little Eldorado creek drainages. The habitat loss largely would be mitigated by regrowth of preferred hardwood browse species that would occur on stabilized stockpiles once reclamation occurred.

Some indirect habitat loss for moose might occur. It is expected that individual moose usually would avoid the major facilities, but generally would use habitat in areas adjacent to project operations as they do elsewhere in Alaska near human activities.

Both black and brown bears would experience a direct habitat loss, as well as some unpredictable level of indirect habitat loss. Both species likely have already lost some habitat indirectly because of the continuing mining exploration activities, human settlement, and other uses in the project area. Additional indirect habitat loss from the project likely would be marginal, and would cease once operations stopped. These losses would not be significant because of the bears' large home ranges, which include adjacent drainages. Nonetheless, some bears would be displaced to other areas. Brown bears, in particular, seek to avoid human activity and would be affected more heavily than black bears. Black bears, if not attracted by improper garbage disposal or feeding, also would tend to avoid the area, but they are normally more accommodating to human activity than brown bears. Both species are common throughout the Interior.

The open pits, development rock and growth medium stockpiles, and the maintenance complex would disrupt large-mammal movement patterns to some extent. Because the mine pits and the maintenance complex would not be fenced, some animals, most likely moose, would occasionally wander into these facilities. These animals usually would not be harmed, but probably would need to be herded out by project personnel. In unusual cases, the animals might have to be tranquilized and moved.

The solid waste disposal facilities would be maintained in a manner that would not attract wildlife such as black bears. Putrescible wastes would be stored indoors, or would be stored outdoors in closed containers in a fenced area to prevent access by wildlife. All putrescible refuse would be shipped to the FNSB solid waste landfill. If, however, these procedures were not rigidly adhered to, or if the prohibition against feeding of animals were not strictly enforced, bear/human contacts might occur that would result in serious injury to workers or the death of wildlife.

Movements of mammals largely would be unaffected. Large mammals, such as moose, bears, and wolves, would cross roads easily, but would have to alter their movements to avoid the open pits. This would be a minor impact. Smaller mammals, with smaller home ranges, would be less likely to encounter new project roads, but would have no trouble in crossing them. While any road poses some threat of collision to animals, the generally slow-moving nature of the ore haul trucks would make collisions less likely, especially when compared with the generally accepted risk of collision with normal traffic on the Steese Highway in the same area.

4.7.3 POST-MINING IMPACTS

At completion of the project, implementation of the project reclamation plan (FGMI, 2000b) likely would result in a major portion of the project footprint being returned to wildlife habitat. If the various development rock stockpiles were contoured and revegetated successfully, a substantial portion of the disturbed area would become wildlife habitat. Although likely different from present habitats in several respects, these areas could nonetheless support healthy wildlife populations. Moose could benefit substantially, especially during the early successional stages of hardwood plant species such as willow, birch, and poplar.

4.8 THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN

4.8.1 THREATENED AND ENDANGERED SPECIES

As noted in Section 3.13 (Threatened and Endangered Species), there are no threatened or endangered species in the True North project area.

4.8.2 SPECIES OF CONCERN

There are four species of concern, and one sensitive species, in the True North project area.

Lynx

The True North project area contains lynx habitat and this species is likely present in fluctuating numbers depending on abundance of prey species. Because lynx generally avoid human activity, the magnitude of the proposed project likely would cause lynx to avoid the area during the life of the project. This would be significant only on a local level. Following mine closure, reclamation, and a return to the proposed post-mining land use of wildlife habitat, lynx likely would be present again in the area over time.

Peregrine Falcon

Because there is no nesting habitat in or near the True North project area, and the nearest nesting peregrines are on the lower Chena River near Moose Creek Dam and on Birch and Beaver creeks, there is no reason to suspect that the project area would be used regularly by migrating falcons for hunting, staging, or as a migration corridor. Therefore, development of the project would not cause any significant impacts to this species.

Northern Goshawk

The True North project area contains habitat for the sensitive Northern Goshawk species, and three active nests were identified there from 1996 to 1998 (Fig. 3.8-1). It is difficult to predict accurately how the proposed project would affect these nests because goshawks occasionally will nest near human activity. It is likely, however, that the nest that was active in 1997, located only approximately 1,000 feet from the edge of a proposed development rock or growth medium storage pile, might not be used for the duration of the project. The nest located approximately 6,500 feet from the edge of the storage pile, would more likely support a nesting pair, but this cannot be predicted. The nest located approximately 16,600 feet from the storage piles likely would not be affected by project activity. These impacts would be significant only on a local basis.

The three nest trees, however, would not be physically disturbed by project activities. Following mine closure, reclamation, and a return to the proposed post-mining land use of wildlife habitat, these nest trees, or others in the area, would be expected to again support active nests within a relatively short period.

Olive-sided Flycatcher

Portions of the True North project area contain good Olive-sided Flycatcher nesting habitat, and several nesting territories were identified. As shown in Figure 3.8-1, two territories are located in areas that would be disturbed by the proposed project pits or stockpiles, and an additional two or three are located within approximately 4,000 feet of such disturbance.

At least two territories would be eliminated by excavation of the mine pits. This would be significant only on a local basis. The other recently identified active territories, at considerably greater distances from project activities, likely would not be affected. Following mine closure, reclamation, and a return to the proposed post-mining land use of wildlife habitat, the presently active territories might again support active nesting, but it likely would take several decades at best, and the topography of the reclaimed mine pits might prevent that from occurring. This impact also would be significant only on a local basis.

Harlequin Duck

Because habitats suitable for Harlequin Ducks do not exist in the True North project area, it is very unlikely this species would occur there. Therefore, development of the project would not cause any significant impacts.

Plants

Because habitats supporting the five plant species of concern do not exist in the True North project area, it is very unlikely these species would occur there. Therefore, development of the project would not cause any significant impacts.

4.9 AIR QUALITY

In this section, air quality impacts are discussed in the context of meeting the NAAQS standards because they provide specific, measurable criteria with which to determine significant impacts. In this context, air quality would not suffer significant impacts from project development.

Because of the project's relatively small size, and because it would have no on-site, point source process facilities, the project would not require an Air Quality Permit to Operate from ADEC. However, any emissions still would have to meet existing air quality standards, particularly for fugitive emissions.

The milling method for this project, to be done at the Fort Knox Mill, has the potential to emit regulated pollutants from certain processes, and fugitive emissions of particulate matter could be released during open-pit mining, as well as during crushing and grinding operations. The application of standard industry procedures, and adherence to regulatory requirements, would reduce such emissions to insignificant levels. The existing permitted Fort Knox Mill has already met these standards and would continue to do so.

Because power would be purchased from existing GVEA facilities, the only onsite power generation facility would be an approximately 125 kW emergency generator which would produce insignificant emissions during its very infrequent use. The following discussion describes potential sources of pollutants, other than those for the existing permitted Fort Knox Mill facility, and the mitigation to be used to prevent these emissions.

4.9.1 FUGITIVE SOURCES

Several processes potentially could cause particulate matter to be entrained in the atmosphere. By definition, such particulate matter would be considered a fugitive emission because it would not be released from a source such as a stack or chimney. Potential fugitive sources include open-pit mining, vehicle movements on unpaved roads, ore-crushing, and unvegetated rock dump and growth medium stockpiles. Dust particles created from these activities would be relatively large, in contrast to process-type particulate matter emissions. If the larger particles become airborne, they would be expected to settle out in a relatively short distance from their source.

To mitigate the release of fugitive particulates FGMI would use commonly accepted measures. The facility would use a water truck to control dust in the mine pit and on the roads, including the route to the Fort Knox Mill, during dry or windy summer conditions. Chlorides and water would be used to control dust during winter, if necessary. Snow could also be plowed onto the road surface to freeze and cap dust. The overburden and growth medium stockpiles would be stabilized and revegetated as soon as practicable after their creation. Proper application of these measures would result in an insignificant release of fugitive dust.

4.9.2 MOBILE SOURCES

Mobile equipment at the project site would be minor sources of air pollutants. A preliminary list of this equipment is presented in Table 2.2-4. The majority of this equipment would burn diesel fuel, releasing small quantities of carbon monoxide, particulate matter, nitrogen oxides, and unburned hydrocarbons. The small quantity of this equipment indicates that total emissions would be small and the area in which the equipment would operate would be relatively large. Operation of these mobile sources would not result in significant impacts to ambient air quality.

4.10 NOISE AND VIBRATION

In this section, discussion of noise and vibration impacts are considered in the context of meeting the FHWA roadway noise abatement criteria (Type B) for picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, (exterior) motels, hotels, schools, churches, libraries and hospitals at the nearest public receptors. These criteria are applied because they are widely used in determining traffic noise impacts and provide specific, measurable standards with which to determine significant impacts. There are no state or local noise standards applicable to the project area. In this context, because these standards would no be exceeded, no significant impacts from noise would result from project development. The following analysis is based primarily on Minor & Associates (2000).

4.10.1 POTENTIAL NOISE SOURCES

Noise sources associated with the type of mining process proposed for the True North project include general construction equipment (loaders, trucks, dozers), support equipment (water trucks, compressors, light plants), and blasting-related equipment (rock drills) as well as blasting itself. Noise levels resulting from mining operations, construction equipment, and ore hauling would vary depending on the type of equipment used, the number of concurrent activities, and the distance and topography between the operations and the particular receiver.

Table 4.10-1 provides the reference noise levels for mining equipment to be used for the True North project. The levels were taken from measured noise levels during normal use at actual mining operation or construction sites, or from the EPA (1971b) and other sources. These are the noise levels and numbers of operating equipment used in projecting noise levels at the 15 receiver locations discussed below.

Table 4.10-1
Reference Equipment Noise Levels and Number in Use Simultaneously

Description	Number in Use Simultaneously [1]	Sound Level[2] (individual equipment @ 50 feet)
Bucket Loader (Cat 980 or equivalent)	2	88.8
Haul Trucks, 100 ton	2 to 3[3]	88.2
Ore Trucks, tractor-trailer	1 to 2[4]	88.2
Water Truck	1	90.8
Front End Loader	1	80.1
Fork Lift	1	73.1
Dozer (Cat D8/9 or equivalent)	1	92.2
Rock Drill	1	94.8
Compressors, light plants and other small engine powered equipment	4[5]	73.6

1 Number of pieces in use at the mine site. Does not include trucks off site hauling ore to the Fort Knox Mill.
2 Each piece of equipment under normal operation as measured at a distance of 50 feet.
3 Predictions assume trucks in use and idling, with three total trucks available at the mine site.
4 Predictions assume 1 to 2 trucks in operation, and 1 to 2 trucks idling at the site in staging or waiting to be loaded with ore.
5 Assumes mixture of compressors, light plants, small engine powered generators, welders and other operational and maintenance equipment. This is a minimal component of sound during normal operations.

Blasting

Mining operations at True North usually would involve one, but occasionally as many as three, blasts per day, five days a week. These would occur within a short time span, usually less than 40 minutes, at approximately 3:00 PM. Blasting of the type expected to take place at the True North Mine would result in maximum sound levels of 125 dBC at 100 feet or 105 dBC at 1,000 feet.

4.10.2 NOISE REGULATIONS AND STANDARDS

This section contains information on the noise standards and regulations that were used for evaluation of potential impacts associated with the True North project. Included are the FHWA traffic noise criteria and the EPA guidelines for community noise and noise related to blasting. These criteria are used because they provide specific, measurable standards with which to determine impacts.

For reference, Table 4.10-2 shows sound levels for some common noise sources and compares their relative loudness to that of an 80 dBA source such as a garbage disposal or food blender.

Table 4.10-2-
Sound Levels and Relative Loudness of Typical Noise Sources found in Indoor and Outdoor Environments

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (human judgment of diff. sound levels)
Jet aircraft takeoff from carrier (50 ft)	140	Threshold of pain	64 times as loud
50-hp siren (100 ft)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 ft)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 ft)	110		8 times as loud
Jet takeoff (2,000 ft)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 ft)	90		2 times as loud
Garbage disposal, food blender (2 ft), Pneumatic drill (50 ft)	80	Moderately loud	Reference loudness
Vacuum cleaner (10 ft) Passenger car at 65 mph (25 ft)	70		1/2 as loud
Large store air-conditioning unit (20 ft)	60		1/4 as loud
Light auto traffic (100 ft)	50	Quiet	1/8 as loud
Bedroom or quiet living room Bird calls	40		1/16 as loud
Quiet library, soft whisper (15 ft)	30	Very quiet	
High quality recording studio	20		
Acoustic Test Chamber	10	Just audible	
	0	Threshold of hearing	

Sources: Beranek (1988) and EPA (1971)

4.10.3 FHWA TRAFFIC NOISE CRITERIA

The traffic noise impact criteria for federal funded road and highway projects are taken from Title 23 of the *Code of Federal Regulations* (CFR) Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, FHWA. The criterion applicable for residences, churches, schools, recreational uses, and similar areas is an exterior hourly equivalent sound level (L_{eq}) from the project that approaches or exceeds 67 dBA. The criterion applicable for other developed lands, such as commercial and industrial uses, is an exterior L_{eq} that approaches or exceeds 72 dBA. No criterion exists for underdeveloped lands or construction noise. A summary of the FHWA noise regulations is contained in Table 4.10-3.

Table 4.10-3
FHWA Roadway Noise Abatement Criteria

Land Use Category		**Hourly Leq (dBA)**
Type A	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose	57 (exterior)
Type B	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, (exterior) motels, hotels, schools, churches, libraries and hospitals	67 (exterior)
Type C	Developed lands, properties or activities not included in the above categories	72 (exterior)
Type D	Undeveloped land	--
Type E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums	52 (interior)

4.10.4 EPA NOISE INCREASE GUIDELINES

Table 4.10-4 contains the EPA standards that can be used as a guideline for expected community reaction to a noise increase above existing ambient levels.

Table 4.10-4
EPA Guidelines for Expected Noise Increase Impact

Increase in Noise over Existing Level	Expected Community Reaction
0 - 5 dBA	Few complaints if gradual increase
5 - 10 dBA	More complaints, especially if conflicts with sleeping hours
Over 10 dBA	Substantial number of complaints

4.10.5 BLASTING NOISE AND NOISE LEVEL DESCRIPTORS

Evaluation of blast noise was performed using the C-weighting scale. For short-term and impulsive noises, such as surface blasting, the C-weighted filter is normally used. The C-weighted filter helps to account for the short time period and low frequency content characteristic of blasting. Measurements taken with the C-weighting filter are denoted dBC. Table 4.10-5 provides information on blasting, blast levels in dBC and community response based on the number and relative sound level of the blast.

Table 4.10-5 EPA Limits on Number of Blasts for Different Blast Levels	
Blast Level in dBC	**Permissible Daily Number**
Above 125	0
123 - 125	1
121 - 122	2
120	3
119	4
118	5
117	6
116	8
115	10
114	12
113	16
112	20
111	25
110	32
109	40
108	51
107	64
106	80
105	100

4.10.6 PROJECT NOISE AND VIBRATION IMPACT CRITERIA

Using the EPA and FHWA noise regulations and standards described above in Section 4.10.2, the following noise criteria were developed for analysis of this project to protect the health and welfare of noise sensitive land uses near the proposed mine site and access haul road corridor.

4.10.7 NOISE IMPACT CRITERIA

For the purpose of performing the noise impact analysis, 15 receivers were selected as representative for operational noise and 12 receivers were selected as representative for potential noise related to the proposed access haul route. The severity of noise impacts will be determined by the project related increase over the existing average ambient noise level and the project related energy average hourly noise level (L_{eq}), at each representative receiver location. As previously stated, human sensitivity to changes in noise levels will vary depending on certain conditions. Normally, the smallest change in ambient (broadband) noise levels that a human ear can perceive is about 3 dBA. Increases of 5 to 7 dBA or more in noise are usually noticeable to most people, and a 10-dBA change is judged by most people as a doubling of the sound level. Given this information, the measured existing noise levels and information from the EPA and US Bureau of Mines the impact criteria derived for the project are given in Table 4.10-6.

Table 4.10-6
Significance of Noise Impacts

Generally Not Significant	Possibly Significant	Generally Significant
No noise-sensitive sites are located in the project area or the increase in noise levels with implementation of the project are projected to be less than 3 dBA at noise sensitive sites	Increases in noise levels with implementation of the project are expected to be between 3 dBA and 10 dBA, and the overall project related hourly average noise level does not exceed 50 dBA L_{eq}. Determination of significance will also consider existing noise levels and the presence of noise-sensitive sites.	Project would cause an increase in the existing noise levels of over 10 dBA, and overall project related hourly average noise levels of over 55 dBA L_{eq}. Determination of significance will also consider existing noise levels and the presence of noise-sensitive sites.

In addition to the criteria given in Table 4.10-6, noise sensitive receivers along the proposed access haul route that exceed the FHWA impact criteria given in Table 4.10-

3, or that have a 10 dBA L_{eq} increase in hourly noise levels related to the project, also would be considered as having a significant traffic noise impact.

4.10.8 VIBRATION IMPACT CRITERIA

There are no existing vibration criteria applicable to the proposed Project. Estimates of expected vibration levels are used since vibration readings are dependent on the source of vibration, transmitting medium and distance from the vibration source. For the purpose of this report, vibration impacts will include those that may interrupt normal living or working conditions at sensitive receptors located close to the facility, or those that may cause structural damage to nearby buildings or environment. Separate vibration criteria were developed for blasting and other vibration producing activities, such as general operation of the mine and mine related traffic.

Vibration from mining related activities, such as mechanical digging, rock breaking and vehicle traffic are only expected to be perceptible within a few hundred feet of the activity, and no impacts are expected. However, criteria were developed for the project to assure that there would not be any vibration related impacts. The vibration criteria are derived from the US Department of Transportation (USDOT) guidelines for the evaluation of impacts due to vibration. The criteria are given in Table 4.10-7. These criteria are not applicable to blasting due to the short duration and lower frequency associated with blasts. Vibration levels from general operation and traffic do not have the same level of annoyance as the vibration produced from blasting.

Table 4.10-7
General Vibration Peak Particle Velocity Guidelines

Velocity (in/sec)	Effects on Humans	Effects on Building
0 to 0.01	Imperceptible by people--no intrusion.	Vibrations unlikely to cause damage of any type.
0.04 to 0.08	Threshold of perception--possibility of intrusion.	Vibrations unlikely to cause damage of any type.
0.15	Vibrations perceptible.	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected.
0.64	Level at which continuous vibrations begin to annoy people.	Virtually no risk of "architectural" damage to normal buildings.
1.27	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relatively short periods of vibrations).	Threshold at which there is a risk of "architectural" damage to normal dwellings - houses with plastered ceilings and walls.
2.54 to 3.81	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges.	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possible minor structural damage.

The US Bureau of Mines (BOM, 1971) defines a vibration blasting criterion. The safe blasting vibration criterion is given in terms of particle velocity in inches-per-second at the frequency where most blasting energy is normally located (approximately 40 Hz). The level of vibration considered the threshold of the “safe blasting criteria” is 2.0 inches-per-second. Table 4.10-8 lists the blasting vibration criteria used to analyze the proposed True North mining operation.

Table 4.10-8
Significance of Blasting Vibration Impacts

Generally Not Significant	Possibly Significant	Generally Significant
No vibration-sensitive sites are located in the project area or the increase in vibration levels with implementation of the project remain below 0.5 in/sec at vibration sensitive sites	Increases in vibration levels during blasting are between 0.5 in/sec and 2.0 in/sec. Determination of significance will also consider existing noise levels and the presence of noise-sensitive sites.	Proposed project would cause an increase in the vibration levels during blasting of greater than 2.0 in/sec.

4.10.9 NOISE ANALYSIS PROCESS

This section describes how operational noise levels were predicted, and how the impact analysis was made. The project area was examined for existing sensitive receivers located within approximately 4 to 5 miles of the proposed mine site, or within 2000 feet of a potential access haul route. Fifteen receiver locations were selected to represent nearby noise sensitive residential neighborhoods for operational noise from the True North Mine site. An additional twelve receiver locations, discussed in section 4.10.6 (Traffic Analysis), were selected for a separate noise analysis related to the proposed access haul route**.**

Operational noise level projections were performed using the methods described in the EPA (1971b) in addition to information from other acoustical sources related to the type of expected noise producing activities. Reference noise levels for equipment were taken from the same EPA document, or from the actual measured noise level of equipment in use at actual construction sites or mining operations. The reference levels are given in the following section. Traffic noise levels are predicted using the FHWA traffic noise prediction model (FHWA, 1998). Input data to the model are provided below.

Atmospheric Conditions Used in the Analysis

In most areas temperature and other changes in atmospheric conditions will have a minimal effect on the transmission of noise. However, because of the extreme changes in atmospheric conditions and ground cover in the project area, several different calculations were performed to simulate the changing conditions and project noise levels for the impact analysis. Information on the temperature, ground cover, and humidity were taken from information posted by the Fairbanks National Weather Service on average climatic data taken between 1961 and 1990. This information was used to establish three average conditions that were used in the analysis. Summary information of atmospheric and ground cover information used in the analysis is given in **Table 4.10-9.**

Table 4.10-9.
Atmospheric and Ground Cover Information by Season[1]

Season[2]	**Ground Cover**	**Max Temp**[3]	**Min Temp**[4]	**Humidity**[5]
Winter (Late November – February)	Powder Snow	0	-20	20
Spring/Fall (March – May & September – Mid November)	Granular Snow	45	28	50
Summer (June – September)	Field Grass	70	50	70

Complete data on temperature, precipitation and chance of precipitation given in Appendix D.
Some overlap was used to better approximate the seasonal changes and conditions.
Average maximum temperature during the specified months.
Averaged minimum temperature during the specified months.
Humidity based on averaged daily mean precipitation, snowfall and chance of precipitation.

Operational Noise Levels

Noise levels at each selected receiver location were projected by logarithmically summing the individual noise level for each piece of equipment expected to be in use at the mine site, with appropriate noise level corrections. Acoustical corrections used in the analysis include: number of pieces of equipment in operation (i.e., number of ore trucks in concurrent operation); distance; topography; level of use (i.e., minutes per hour the piece of equipment would be used); foliage; temperature; physical shielding; and mitigation measures such as noise barriers. Because of the varying level of foliage and temperature changes in the area, three sets of noise level calculations were performed. All three-analysis scenarios assume the shortest distance to the mining operations from the receiver location. The calculation scenarios are described in detail below.

Scenario 1: Average or nominal noise level calculations. Scenario 1 assumes average temperatures and some foliage reduction with no additional noise reduction due to topography or shielding, such as berms. This calculation scenario, which is representative of transitional months such as the spring and fall months, would occur frequently during summer and some winter months. Scenario 1 conditions, considered the nominal and most common condition, are projected to occur 50 to 60 percent of the time.

Scenario 2: Minimum noise level calculations. Scenario 2 assumes normal noise reductions for foliage and average to moderate temperatures. This calculation would be most representative of summer months. Scenario 2 conditions are projected to occur 20 to 30 percent of the time.

Scenario 3: Maximum noise level calculations. This calculation scenario would be most representative of coldest winter months when temperatures are at and below zero degrees Fahrenheit and noise transmission is at maximum. Under this scenario, only a minimal noise reductions related to foliage was applied, and no reductions were assumed for topography or shielding. In addition, because of the higher level of noise transmission, the ambient noise levels were also increased by 3 dBA. Scenario 3 conditions are projected to occur less than 20 percent of the time.

All calculations assume the same amount of mine related equipment in operation. In addition, in order to perform a conservative calculation, no additional noise reductions were assumed for existing or constructed berms or ore stockpiles. Given these safety factors, the projected noise levels can be considered the “worst case” noise levels to be produced at the site.

4.10.10 TRAFFIC NOISE MODELING METHODS

For areas that could experience an increase in noise levels related to ore hauling, the FHWA (1998) traffic model was used to predict traffic noise levels. Input to the model included number of vehicles per hour (broken into three vehicle classes), average travel speed, ground conditions, temperature, humidity, and general roadway, receiver and area topographical information. Vehicle classification used in the analysis was passenger vehicles, medium trucks such as delivery trucks, and heavy trucks such as the proposed ore trucks and existing tractor-trailers currently serving Fort Knox. For passenger vehicles and medium trucks, the noise model used national average measurements for the noise level predictions. Ore truck noise levels used in the analysis were measured noise levels taken on a similar truck along Fairbanks Creek Road on Monday, July 10, 2000.

4.10.11 REFERENCE EQUIPMENT NOISE LEVELS

Where ever possible, the noise levels used in the analysis were actual measured noise levels of similar equipment during the types of operations expected at the True North Mine site. In addition to noise levels of the general equipment located at the mine site, pass-by measurements were taken of an ore truck under several different operational conditions along Fairbanks Creek Road. The measured data from the pass-by measurements was normalized and used in the traffic noise analysis. The following sections provide the reference levels used in the analysis.

Reference Noise Levels for Mine Site Equipment

Table 4.10-10 provides the reference noise levels used in the calculations. The levels were taken from measured noise levels during normal use at actual mining operation or construction sites, or from the EPA and other sources. These are the noise levels and numbers of operating equipment used in projecting normal operational noise levels at sensitive receiver locations.

Table 4.10-10
Reference Equipment Noise Levels and Number in Use Simultaneously

Description	Number in Use Simultaneously[1]	Sound Level[2] (individual equipment @ 50 feet)
Bucket Loader (cat 992 or equivalent)	2	88.8
Ore trucks, 100 ton	2 to 3[3]	88.2
Ore Trucks, tractor-trailer	1 to 2[4]	88.2
Water Truck	1	90.8
Front End Loader	1[5]	80.1
Fork Lift	1	73.1
Dozer (D10N)	1	92.2
Rock Drill (DM45)	1	94.8
Compressors, light plants and other small engine powered equipment	4[6]	73.6

Number of equipment pieces in use at the proposed mine site. (Does not include trucks off- site hauling ore to Fort Knox).
Each piece of equipment under normal operation as measured at a distance of 50-feet.
Predictions assume trucks in use and idling, with three total trucks available at the mine site.
Predictions assume 1 to 2 trucks in operation, and 1 to 2 trucks idling at the site in staging or waiting to be loaded with ore (8 trucks total in use).
The 988 will serve as both a front end loader and a fork lift.
Predictions assume a mixture of compressors, light plants, small engine powered generators, welders and other operational and maintenance equipments. This is a minimal component of sound under normal operation.

4.10.12 Reference Ore truck Noise Levels and Pass-By Measurements

Reference ore truck pass-by measurements were made using an ore truck of similar engine horsepower and size as the proposed project ore haul trucks. The measurements were taken on July 10, 2000 under normal summertime atmospheric conditions with a slight wind (5 to 10 mph) blowing to the east-northeast. The measurements were made in accordance with FHWA and ANSI standards for pass-by measurements. Because of the relative close proximity of the measurement equipment (50 and 100 feet from the travel lane), varying atmospheric conditions would have little to no affect on the transmission of the truck noise. Figure 4.10-1 is a diagram of the test setup, location of the monitoring equipment, and ore truck travel route.

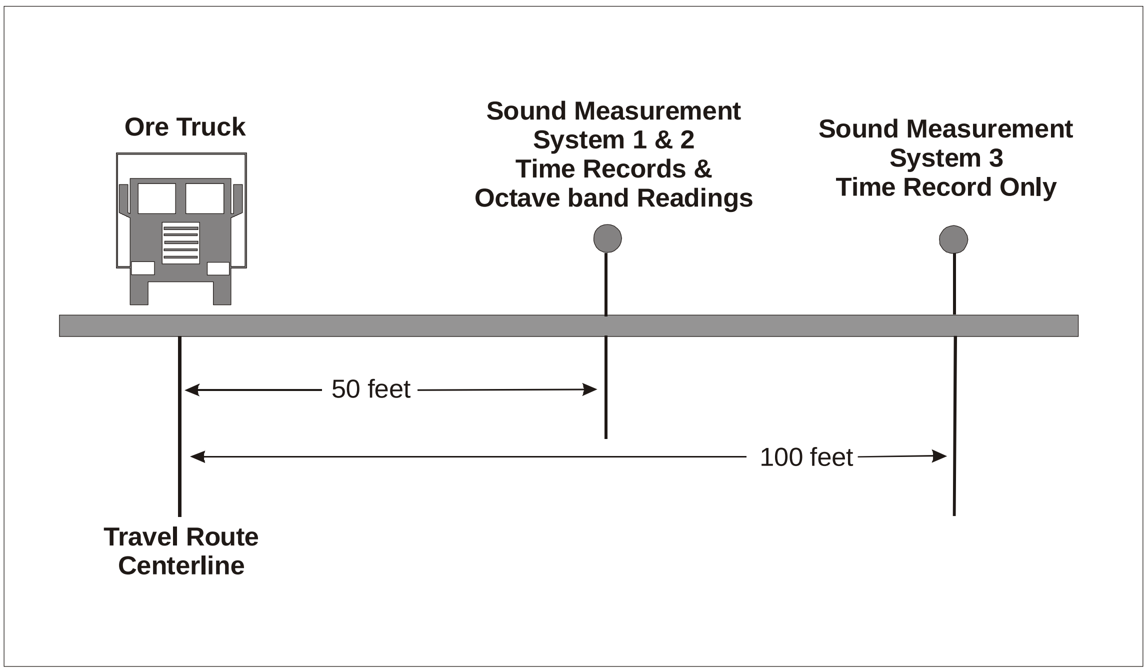


Figure 4.10-1

Pass-by Measurement Diagram

Several pass-by noise level measurements were taken under different travel conditions, including normal hauling with a full load, normal hauling without a load, pulling a hill in low gear with a full load, normal and loaded acceleration, and standing normal and maximum engine idle measurements. The measured noise levels were grouped by pass-by characteristics, and normalized maximum sound levels were developed for six representative operational conditions. Figure 4.10-2 is a graph of the normalized six pass-by measurements at distances of 50 and 100 feet from the centerline of the haul route. The six tests were grouped together for ease of presentation. Table 4.10-11 contains the details on the operational characteristics for each of the tests with the maximum noise levels measured at each distance.

Figure 4.10-2 Pass-By Noise Level Measurements

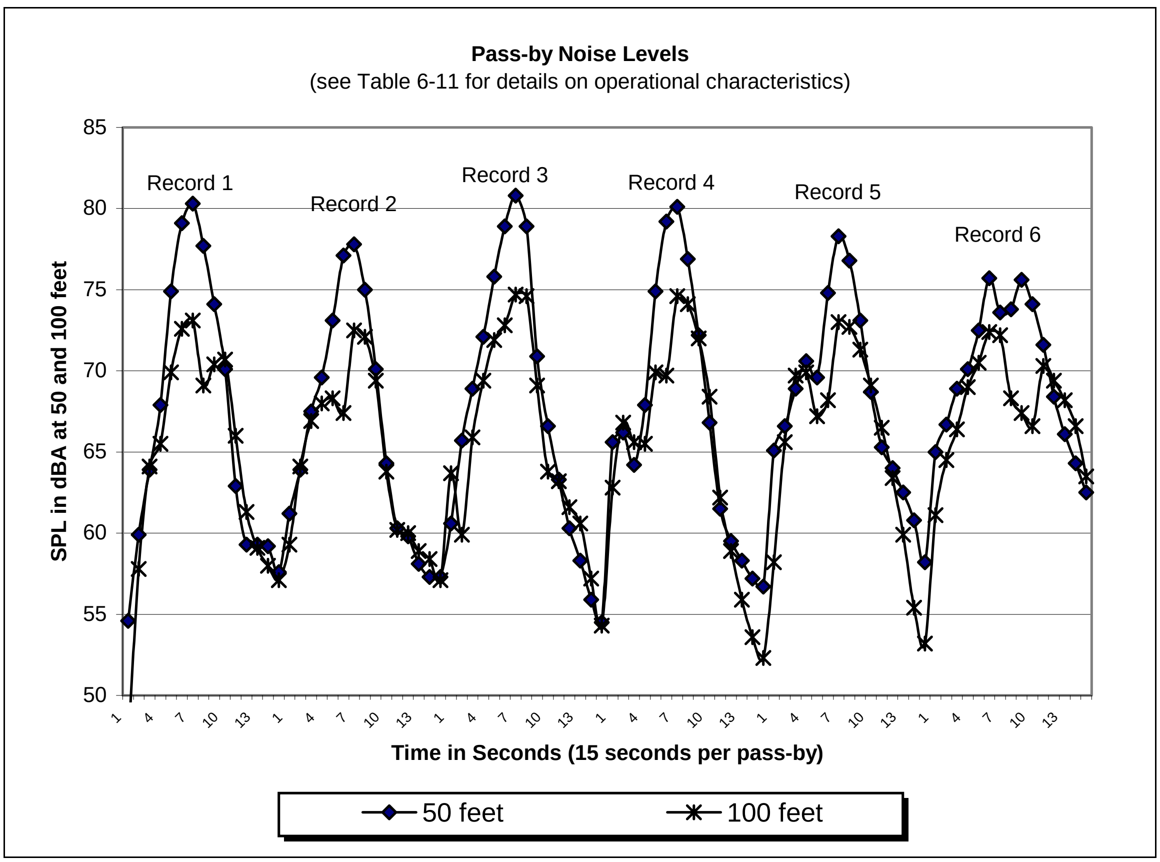


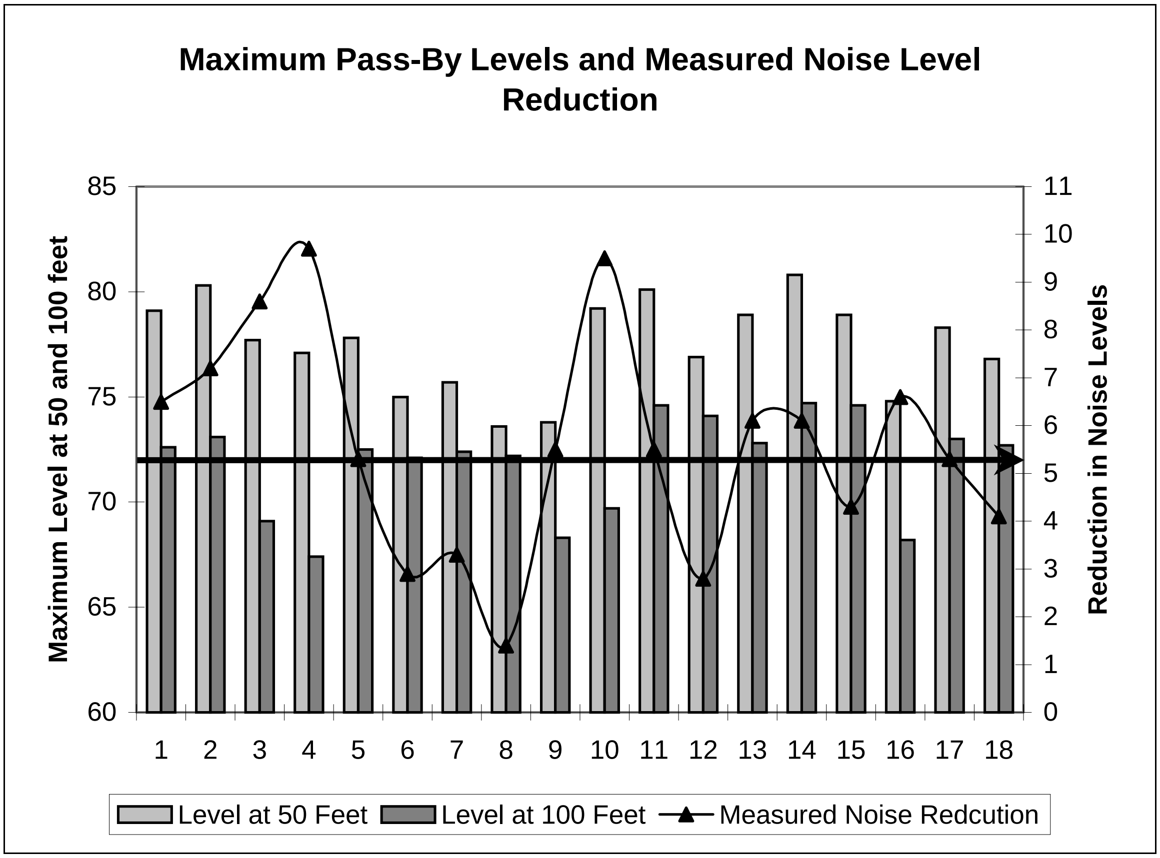
Table 4.10-11
Ore Truck Operational Characteristics and Normalized Pass By Levels[1]

Test[2]	Operational Characteristics	Sound Level Information		
		50 ft[3]	100 ft[3]	Reduction[4]
1	Normal Operation – Loaded	80.3	73.1	7.2
2	Normal Operation – Unloaded	77.8	72.5	5.3
3	Acceleration – Loaded	80.8	74.7	6.1
4	Acceleration – Unloaded	80.1	74.6	5.5
5	Quiet Pass-by – Loaded (with gear change)	78.3	73	5.3
6	Quiet Pass-by – Unloaded (with gear change)	75.7	72.4	3.3

1. See Figure 6-3 for test setup
2. See Figure 6-4 for measured data
3. Normalized maximum sound for given operational characteristics
4. Measured reduction in noise level between the two monitoring location

The pass-by measurements also were used to verify the nominal near field noise reduction characteristics of a typical ore truck. Figure 4.10-3 contains a bar graph of the highest measured levels of the representative pass-bys given in Figure 4.10-2. The figure also contains the noise level reduction between the 50 foot and 100 foot measurement and a calculated overall average with the highest and lowest values removed. The projected nominal noise level reduction was calculated at 5.5 to 5.7 dBA, or 1 dBA higher than the 4.5 dBA used by the FHWA. The higher reduction obtained in the testing is due to the single vehicle pass-by being somewhat closer to a point noise source than the 4.5 dBA reduction associated with steady flowing traffic along a roadway. However, in order to maintain a conservative analysis, the FHWA 4.5 dBA noise reduction characteristic was used in the traffic noise analysis.

Figure 4.10-3 Maximum Pass-By Noise Levels and Noise Reduction Factors



4.10.13 MINE OPERATION ANALYSIS

The noise impact analysis was performed in three parts: 1) True North operations analysis for noise at the mine site (Section 4.10.5); 2) haul route noise related to ore trucks moving ore between the True North Mine site and the Fort Knox Mill (Section 4.10.6); and, 3) a cumulative analysis of all associated noise related from the project, where appropriate (Section 4.10.7). Details on the noise calculations and results are given below, with separate discussions for each of the potentially affected residential subdivisions.

Noise levels related to mine site operations were projected at 15 representative receiver locations within 4 to 5 miles of the proposed site. In addition to general operational noise, access haul route calculations also were performed. Figure 4.10-4 provides an overview of the receiver locations for operational impact analysis.

Table 4.10-12 provides a summary of the project related noise level at each receiver location. In addition, brief descriptions of each of the receiver locations along with a general discussion of the predicted noise levels are given in the following paragraphs.

For the purpose of discussing potential noise levels and performing an impact analysis, the study area was divided in to three areas: Olnes, Haystack, and Pedro Dome/Cleary Summit. Operational noise levels at each of the areas are described in detail in the following sections. The discussion includes comparisons of the daytime and nighttime noise levels, for the existing conditions, future conditions with mining operations, and the projected difference at each of the 15 representative locations. An additional analysis of traffic noise and noise related to blasting is included where applicable. Because all residential areas are greater than 5000 feet from the mine site, no vibration impacts are projected.