NOISE

Baseline Noise Studies
Montana Project
Lincoln County, Montana

Prepared for

Noranda Minerals Corp

Libby, Montana

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Project No. 22134

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SUMMARY

A baseline noise study was conducted during September 8-10, 1988. The objective of the study was to establish baseline noise levels in the study area. Ambient noise levels were measured near the two meteorological monitoring stations located at the head of Ramsey Creek, and at the Little Cherry Creek Tailing disposal area.

The sampling program consisted of collecting half-hour averages of A-weighted equivalent sound levels (L_{eq}) and calculating statistical properties of the noise data (L(N)). L(N) values represent the percentage of the measurement time during which a certain sound level is always exceeded. For example, the L(90) value is the sound level that is exceeded 90 percent of the time. In addition, an octave filter was used to collect instantaneous A-weighted sound levels at 10 frequency bands. The octave band data consists of instantaneous readings as observed from the sound meter for the frequency level being monitored. Ambient noise data were collected during the daytime and nighttime hours for both weekday and weekend periods. The sampling periods for the L_{eq} and L(N) averages were a half-hour.

The weekday equivalent sound levels measured during the daytime (L_d) and nighttime (L_n) at the Ramsey Creek site were 41.3 dBA and 28.8 dBA, respectively. The L_{dn} value was 40.5 dBA. The weekend L_d and L_n values were 40.1 dBA and 31.3 dBA, respectively, and the L_{dn} was 40.6 dBA. A yearly average equivalent sound level of 55 dB will generally interfere with most outside activities (EPA, 1974).

The majority of the weekday daytime sound levels at Ramsey Creek ranged from 31.3 dBA to 45.1 dBA, while the weekday nighttime values ranged from 23.7 dBA to 27.9 dBA. During the weekend, the sound levels ranged from 33.7 dBA to 42.9 dBA during the daytime and from 27.1 dBA to 33.9 dBA during the nighttime. These values represent the range in which most

(80 percent) of the sound levels occur (Department of Housing Development, 1972).

The median or average weekday daytime and nighttime sound levels (L(50)) for Ramsey Creek were 36.3 dBA and 25.1 dBA, respectively. The median weekend daytime and nighttime sound levels were 39.1 dBA and 29.1 dBA, respectively.

Examination of the octave band analysis indicates that the noise levels are higher in the middle of the audible frequency range, which is a result of the relative low number of noise sources. The observers noted that noise levels at the Ramsey Creek site consisted mainly of rustling leaves and the sound of Ramsey Creek.

The weekday L_d and L_n equivalent sound levels recorded at the Little Cherry Creek site were 39.0 dBA and 35.5 dBA, respectively, and the L_{dn} was 42.6 dBA. The weekend L_d and L_n equivalent sound levels were 28.6 dBA and 22.7 dBA, respectively, and the L_{dn} was 30.6 dBA.

The majority of the weekday sound levels at Little Cherry Creek ranged from 30.3 dBA to 39.5 dBA, while the weekday nighttime values were all at the level of detection (20 dBA) for the noise analyzer. During the weekend conditions, the majority of the daytime sound levels ranged from 21.5 dBA to 31.7 dBA. The nighttime sound levels ranged from near the detection limit of the instrument to 21.1 dBA.

The median weekday daytime and nighttime sound levels for the Little Cherry Creek site were 34.7 dBA and 20.7 dBA, respectively. The median weekend daytime and nighttime sound levels were 23.3 dBA and 20.7 dBA, respectively. The octave band analysis at the Little Cherry Creek site is similar to the Ramsey Creek site, with the majority of the sound levels occurring in the middle of the audible frequency range.

Baseline noise levels measured at the Ramsey Creek and Little Cherry Creek sites are typical of those that might be found in unpopulated or rural residential areas. Additionally, these data are consistent with the baseline noise levels recorded in the Rock Creek Study Area (Parker, 1987). The daytime baseline noise levels in the Ramsey and Little Cherry Creek Study Area range from 29 to 41 dBA and the baseline noise levels measured in the Rock Creek Study Area range from 25 to 45 dBA. Therefore, the noise levels measured in the Ramsey Creek and Little Cherry Creek sites are believed to be representative of noise levels throughout the area. By comparison, the noise levels measured in the vicinity of the mining activities at Asarco's Troy mine range from 45 dBA to 97 dBA (Parker, 1987).

1.0 INTRODUCTION

Woodward-Clyde Consultants conducted a baseline noise study for the Montana Project during September 8-10, 1988. The objective of the study was to establish baseline noise levels in the study area, located 22 miles south of Libby, Montana. The survey was designed to meet the objectives of Section 13.1 of the Plan of Study (POS) for defining baseline noise levels in the area. A copy of Section 13.1 of the approved POS is contained in the Appendix.

2.0 PROJECT DESCRIPTION

This baseline study was initiated by U.S. Borax as part of the licensing requirements for the development and mining of a silver/copper deposit located underneath the Cabinet Mountain Wilderness Area in the Kootenai National Forest, Sanders and Lincoln Counties, Montana. Whereas the State of Montana, Department of State Lands and the Kootenai National Forest have primary responsibility for permitting these activities, the two agencies and U.S. Borax developed a Plan of Study that defined the nature and extent of the baseline work. This work was initiated in the Spring of 1988 and has been conducted in accordance with the terms of the Plan of Study.

A number of alternative sites were identified for portals, processing plant, tailing disposal and ancillary facilities. The area encompassing and adjacent to these sites then became the focus of the baseline work (Figure 2-1).

In September of 1988 Noranda Minerals Corp. and Montana Reserves formed a venture and purchased the silver/copper deposit from U.S. Borax and continued with project development under the "Montana Project" name. Noranda Minerals Corp. (Noranda) was designated the project manager.

Noranda continued to build from the data and information that had been generated by U.S. Borax and after reviewing the many alternative sites developed the proposed mining program detailed in the Application for a Hard Rock Operating Permit from the Montana Department of State Lands. The application also serves as a proposed Plan of Operation to the Kootenai National Forest. Basically, the application describes a 20,000 ton per day operation accessed from two (twin) portals in Ramsey Creek, a mill site located adjacent to the Ramsey portals, a portal in Libby Creek, two portals in the Rock Creek drainage for ventilation and emergency access, and a tailing impoundment in the Little Cherry Creek drainage. Access to the Ramsey Creek mine site would be over the existing Bear Creek Road. A new

transmission line from Pleasant Valley to the mine site would provide electrical energy for the operation. The total labor force is expected to number approximately 400 people. These positions would be filled by hiring locally as much as possible.

3.1 MONITORING LOCATIONS

Ambient noise levels were measured near the two meteorological monitoring stations located in Ramsey Creek and Little Cherry Creek.

3.1.1 Ramsey Creek Site

The noise monitoring was conducted on the Ramsey Creek Road, adjacent to the Ramsey Creek aerometric monitoring site, located approximately 1.6 km (1.0 mi) from the head of Ramsey Creek in T27N, R31W (Figure 3-1).

3.1.2 Little Cherry Creek Site

The noise monitoring was conducted on Road 6212H, adjacent to the Little Cherry Creek aerometric monitoring site in T28N, R31W (Figure 3-2).

3.2 MONITORING EQUIPMENT

The data acquisition system consisted of the following noise monitoring instrumentation:

- Bruel and Kjaer (B&K) Model 4427 Noise Level Analyzer
- B&K Model 4165 Free Field Microphone
- B&K Model 2230 Integrating Sound Level Meter
- B&K Model 1624 Octave Filter Set
- B&K Model 4230 Acoustic Calibrator

The B&K 4427 noise level analyzer was used to collect half-hour averages of A-weighted equivalent sound levels (L_{eq}). The analyzer also provided calculations of the statistical properties of the noise data (L(N)). L(N) values represent the percentage of the measurement time during which a

certain sound level is always exceeded. For example, the L(90) value is the sound level that is exceeded 90 percent of the measurement time. The B&K 2230 integrating sound level meter along with the B&K 1624 octave filter set was used to collect instantaneous A-weighted sound levels at 10 frequency bands. Octave band measurements were taken prior to and following the half-hour L_{eq} and L(N) sampling period. Both measurement systems were calibrated and adjusted prior to each sampling period using a B&K 4230 acoustic calibrator.

3.3 DATA COLLECTION PROCEDURES

Ambient noise data were collected during September 8-10, 1988. The measurements were collected during the daytime and nighttime hours for both weekday and weekend periods. The sampling periods for the L_{eq} and L(N) averages were a half-hour in duration. The analyzer incorporates 64 instantaneous samples per second for the length of the sampling period. Therefore, statistical data presented for a half-hour sampling period are comprised of 115,200 instantaneous sound level readings.

The octave band data consist of instantaneous readings as observed from the sound level meter for the frequency level being monitored. Octave band data were collected prior to and following the half-hour L_{eq} and L(N) sampling period.

During each sampling period, the observers noted wind speed, temperature and cloud cover estimates as well as a description of the ambient sound levels. The monitoring data were obtained under low wind speed conditions (less than 10 mph), although some samples at the Ramsey Creek site were taken during relatively gusty conditions. However, examination of the wind speed data recorded at the Ramsey Creek meteorological station revealed that hourly average wind speeds ranged from 3 to 7 mph during the noise data collection. Additionally, the backup strip chart recorder indicated no gusts exceeding 10 mph during the baseline noise study.

3.4 DATA ANALYSIS

The data acquisition system described in Section 3.2 contained statistical software that analyzed and processed the noise data. During each test, the noise analyzer computed A-weighted percentile values (L(N)) and the equivalent sound level (L_{eq}) integrated over the sampling period. Both weekday and weekend equivalent sound levels for daytime readings (L_d) and for nighttime readings (L_n) were measured at the two monitoring locations. The daytime and nighttime equivalent sound levels for each site were then used to calculate the day/night equivalent sound level (L_{dn}) using the following equation (EPA, 1974):

$$L_{dn} = 10 \text{ Log}_{10} \frac{(15 \times 10^{L_d/10}) + (9 \times 10^{(L_n+10)/10})}{24}$$

Thus, the L_{dn} is a measurement of the equivalent sound level with a 10 decibel weighting applied to the nighttime hours of 10 p.m. to 7 a.m.

Data collected during the octave band tests were organized such that loudness was assessed at ten frequency bands, selected from the frequency range that would be detected by humans. Frequencies are expressed in hertz (Hz) and loudness is expressed in dBA.

4.0 RESULTS

The ambient noise levels recorded at the Ramsey Creek site and the Little Cherry Creek site for weekday and weekend conditions are presented in Tables 4-1 and 4-2, respectively. Day and night L_{eq} averages, eight percentile averages of (L(N)), and ten octave band samples are presented. For comparison, the average sound levels recommended by the EPA (1974) for various environmental conditions are presented in Table 4-3. This table identifies sound levels required to protect the public health and welfare with an adequate margin of safety.

4.1 AMBIENT NOISE LEVELS AT THE RAMSEY CREEK SITE

The weekday equivalent sound levels measured during the daytime (L_d) and nighttime (L_n) at the Ramsey Creek site were 41.3 dBA and 28.8 dBA, respectively. The L_{dn} value, calculated using the equation in Section 3.4, was 40.5 dBA. The weekend L_d and L_n values were 40.1 dBA and 31.3 dBA, respectively, and the calculated L_{dn} was 40.6 dBA.

The majority of the weekday daytime sound levels ranged from 31.3 dBA to 45.1 dBA, while the weekday nighttime values ranged from 23.7 dBA to 27.9 dBA. During the weekend, the sound levels ranged from 33.7 dBA to 42.9 dBA during the daytime and from 27.1 dBA to 33.9 dBA during the nighttime. These values represent the range of sound levels between L(90) and L(10) which is the range in which most (80 percent) of the sound levels occur (Department of Housing and Urban Development, 1972).

The median or average weekday daytime and nighttime sound levels (L(50)) for the Ramsey Creek site were 36.3 dBA and 25.1 dBA, respectively. The median weekend daytime and nighttime sound levels were 39.1 dBA and 29.1 dBA, respectively.

Examination of the octave band analysis indicates that the noise levels are higher in the middle of the audible frequency range, which is a result of the relatively low number of noise sources. The observers noted that noise levels at the Ramsey Creek site consisted mainly of rustling leaves and the sound of Ramsey Creek.

4.2 AMBIENT NOISE LEVELS AT THE LITTLE CHERRY CREEK SITE

The weekday L_d and L_n equivalent sound levels recorded at the Little Cherry Creek site were 39.0 dBA and 35.5 dBA, respectively, and the calculated L_{dn} was 42.6 dBA. The weekend L_d and L_n equivalent sound levels were 28.6 dBA and 22.7 dBA, respectively, and the calculated L_{dn} was 30.6 dBA.

The majority of the weekday daytime sound levels ranged from 30.3 dBA to 39.5 dBA, while the weekday nighttime values were all at the level of detection (20 dBA) for the noise level analyzer. The disparity between the nighttime equivalent sound level of 35.5 dBA and the L(N) values probably results from a few short-term noise events during the averaging period (i.e. a snapping twig, a gust of wind) that did not register in the statistical averaging. During the weekend conditions, the majority of the daytime sound levels ranged from 21.5 dBA to 31.7 dBA. The nighttime sound levels ranged from near the detection limit of the instrument to 21.1 dBA.

The median weekday daytime and nighttime sound level for the Little Cherry Creek site were 34.7 dBA and 20.7 dBA, respectively. The median weekend daytime and nighttime sound levels were 23.3 dBA and 20.7 dBA, respectively. The octave band analysis at the Little Cherry Creek site is similar to the Ramsey Creek site, with the majority of the sound levels occurring in the middle of the audible frequency range.

4.3 NOISE LEVELS IN THE ROCK CREEK STUDY AREA

Preoperational and operational noise monitoring has been conducted in the Rock Creek Study Area (Parker, 1987) and in the vicinity of mining activities at Asarco's Troy Mine (Parker, 1987). These data are summarized in Tables 4-4 and 4-5. The baseline noise levels ranged from 25 to 45 dBA and noise levels in the vicinity of the mining activities range from 45 to 97 dBA.

4.4 OTHER NOISE DATA

Noise levels produced by logging activities which take place in the Montana Project study area were not measured during the baseline noise survey, as no logging was being conducted during the study. However, chainsaw noise and noises generated by the transport of the timber (heavy trucks) are two major noise sources associated with logging operations which frequently occur in the study area. Chainsaw noises range from 83 dBA at 50 ft. to as high as 115 dBA at the operator position. The noise output common to heavy trucks, such as those used for logging, is 80 to 90 dBA at 50 ft.

5.0 CONCLUSIONS

Baseline noise levels measured at the Ramsey Creek and Little Cherry Creek sites are typical of those that might be found in unpopulated or rural residential areas (see Table 5-1). Additionally, these data are consistent with the baseline noise levels recorded in the Rock Creek Study Area, summarized in Table 4-4, (Parker, 1987). As can be seen from Tables 4-1, 4-2 and 4-4, the daytime baseline noise levels in the Ramsey and Little Cherry Creek Study Area range from 29 to 41 dBA and the baseline noise levels in the Rock Creek Study Area range from 25 to 45 dBA. Therefore, the noise levels measured at the Ramsey Creek and Little Cherry Creek sites are believed to be representative of noise levels throughout the area, in the absence of logging activities. Note that the sound levels in Tables 4-4 and 4-5 are daytime noise levels, and should be compared to the daytime levels in Tables 4-1 and 4-2. When logging activities are taking place, baseline noise levels may approach 115 dBA in the immediate vicinity of the activity.

6.0 REFERENCES

Department of Housing and Urban Development. 1972. Noise assessment guidelines technical background. HUD Report No. TE/NA 172.

Environmental Protection Agency. 1974. Information on noise levels identified as requisite to protect public health and welfare with an adequate margin of safety. EPA-550/9-74-004, Arlington, VA.

Parker, Charles 1987. Rock Creek Noise Report. Prepared for ASARCO, Inc., Troy, Montana

TABLE 4-1
Leq, L(N), AND OCTAVE BAND
SOUND LEVELS - RAMSEY CREEK SITE
MONTANA SILVER VENTURE

LOCATION	EQUIVALENT SOUND LEVEL (Leq in dBA)		DAY-NIGHT SOUND LEVEL	STATISTICAL AVERAGE SOUND LEVELS (L(N) in dBA)			OCTAVE BAND ANALYSIS (dBA)				
								DAYTIME		NIGHTTIME	
	DAYTIME (Ld)	NIGHTTIME (Ln)	Ldn in dBA	L(N)	DAYTIME	NIGHTTIME	FREQ. (Hz)	BEFORE	AFTER	BEFORE	AFTER
RAMSEY CREEK WEEKDAY MEASUREMENTS	41.3	28.8	40.5	L10	45.1	27.9	31.5	0.0	0.0	0.0	0.0
				L20	41.9	26.5	63	0.0	0.0	0.0	0.0
				L30	39.9	25.9	125	12.5	0.0	0.0	0.0
				L40	38.1	25.5	250	18.8	21.3	17.0	0.0
				L50	36.3	25.1	500	27.3	30.5	23.6	25.5
				L60	34.5	24.7	1000	27.8	34.0	24.6	25.2
				L80	32.7	24.1	2000	28.3	28.0	22.0	23.1
				L90	31.3	23.7	4000	19.5	25.0	15.1	0.0
							8000	17.0	23.5	13.3	0.0
							16000	0.0	0.0	0.0	0.0
RAMSEY CREEK WEEKEND MEASUREMENTS	40.1	31.3	40.6	L10	42.9	33.9	31.5	0.0	22.7	0.0	0.0
				L20	41.5	32.3	63	0.0	27.5	0.0	0.0
				L30	40.3	31.1	125	0.0	24.0	0.0	0.0
				L40	39.7	30.1	250	24.6	30.4	22.6	22.5
				L50	39.1	29.1	500	32.5	39.2	27.7	32.1
				L60	37.9	28.5	1000	35.6	41.5	27.4	32.7
				L80	35.7	27.5	2000	31.7	39.6	22.6	27.7
				L90	33.7	27.1	4000	26.3	33.8	0.0	0.0
							8000	0.0	38.2	0.0	0.0
							16000	0.0	20.7	0.0	0.0

TABLE 4-2
Leq, L(N), AND OCTAVE BAND
SOUND LEVELS - LITTLE CHERRY CREEK SITE
MONTANA SILVER VENTURE

LOCATION	EQUIVALENT SOUND LEVEL (Leq in dBA)		DAY-NIGHT SOUND LEVEL	STATISTICAL AVERAGE SOUND LEVELS (L(N) in dBA)			OCTAVE BAND ANALYSIS (dBA)				
								DAYTIME		NIGHTTIME	
	DAYTIME (Ld)	NIGHTTIME (Ln)	Ldn in dBA	L(N)	DAYTIME	NIGHTTIME	FREQ. (HZ)	BEFORE	AFTER	BEFORE	AFTER
LITTLE CHERRY CREEK WEEKDAY MEASUREMENTS	39.0	35.5	42.6	L10	39.5	20.7	31.5	0.0	0.0	0.0	0.0
				L20	38.1	20.7	63	0.0	0.0	0.0	29.0
				L30	36.7	20.7	125	25.0	0.0	0.0	29.0
				L40	35.5	20.7	250	36.0	22.0	0.0	0.0
				L50	34.7	20.7	500	26.3	28.4	0.0	0.0
				L60	33.9	20.7	1000	31.5	36.0	0.0	0.0
				L80	32.1	20.7	2000	31.0	36.5	0.0	0.0
				L90	30.3	20.7	4000	23.0	25.8	0.0	0.0
							8000	0.0	0.0	0.0	0.0
							16000	0.0	0.0	0.0	0.0
LITTLE CHERRY CREEK WEEKEND MEASUREMENTS	28.6	22.7	30.6	L10	31.7	21.1	31.5	0.0	0.0	0.0	0.0
				L20	26.5	20.7	63	0.0	0.0	0.0	0.0
				L30	24.5	20.7	125	24.6	0.0	0.0	0.0
				L40	23.7	20.7	250	23.2	0.0	0.0	0.0
				L50	23.3	20.7	500	22.2	24.4	0.0	0.0
				L60	23.1	20.7	1000	20.8	22.5	0.0	21.2
				L80	22.3	20.7	2000	0.0	0.0	0.0	0.0
				L90	21.5	20.7	4000	0.0	0.0	0.0	0.0
							8000	0.0	0.0	0.0	0.0
							16000	0.0	0.0	0.0	0.0

TABLE 4-3

YEARLY AVERAGE[1] EQUIVALENT SOUND LEVELS IDENTIFIED AS REQUISITE TO PROTECT THE PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY
SOURCE: EPA (1974)

		Indoor			Outdoor		
	Measure	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects(b)	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects(b)
Residential with Outside Space and Farm Residences	L_{dn} $L_{eq(24)}$	45	70	45	55	70	55
Residential with No Outside Space	L_{dn} $L_{eq(24)}$	45	70	45			
Commercial	$L_{eq(24)}$	(a)	70	70(c)	(a)	70	70(c)
Inside Transportation	$L_{eq(24)}$	(a)	70	(a)			
Industrial	$L_{eq(24)}$(d)	(a)	70	70(c)	(a)	70	70(c)
Hospitals	L_{dn} $L_{eq(24)}$	45	70	45	55	70	55
Educational	$L_{eq(24)}$ $L_{eq(24)}$(d)	45	70	45	55	70	55
Recreational Areas	$L_{eq(24)}$	(a)	70	70(c)	(a)	70	70(c)
Farm Land and General Unpopulated Land	$L_{eq(24)}$				(a)	70	70(c)

TABLE 4-3

(Continued)

Code:

(a) Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communications is a critical activity.

(b) Based on lowest level.

(c) Based only on hearing loss.

(d) An $L_{eq}(8)$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than Leq or 60 dB.

Note: Explanation of identified level for hearing loss: The exposure period which results in hearing loss at the identified level is 40 years.

[1] Refers to energy rather than arithmetic averages.

TABLE 4-4
AMBIENT NOISE LEVELS - ROCK CREEK STUDY

LOCATION	TIME	DATE	NOISE LEVELS A WEIGHTED (dBA)	NOISE LEVELS LINEAR (dB)
PLANT SITE				
NEAR PLANT SITE MONITORING WELL	10:44	10/22/85	45	47
NEAR PLANT SITE MONITORING WELL	14:48	10/22/85	37	42
CHICAGO PEAK ROAD TURNOUT	11:11	10/22/85	32	34
SNORT CREEK TURNOUT	14:22	10/22/85	29	31
WEATHER TOWER, CHICAGO PEAK ROAD	14:32	10/22/85	29	32
PORTAL AREA				
UPPER PORTAL SITE	13:42	10/22/85	26	33
WILDERNESS AREA				
CLIFF LAKE TRAIL ABOVE ROAD END	12:38	10/22/85	27	32
OFF ROAD ABOVE CLIFF LAKE DRAINAGE	13:08	10/22/85	27	30
MILWAUKEE PASS	15:20	7/25/86	25	28
NORTH SIDE OF ST. PAUL PEAK NEAR PROPOSED AIR INTAKE	16:45	7/25/86	38	47
NORTH SIDE OF ST. PAUL PEAK NEAR PROPOSED AIR INTAKE	16:55	7/25/86	25	27
NORTH SIDE OF ST. PAUL PEAK NEAR PROPOSED AIR INTAKE	17:05	7/25/86	30	33

TABLE 4-5
ASARCO TROY MINE NOISE MEASUREMENTS, AUGUST 1986

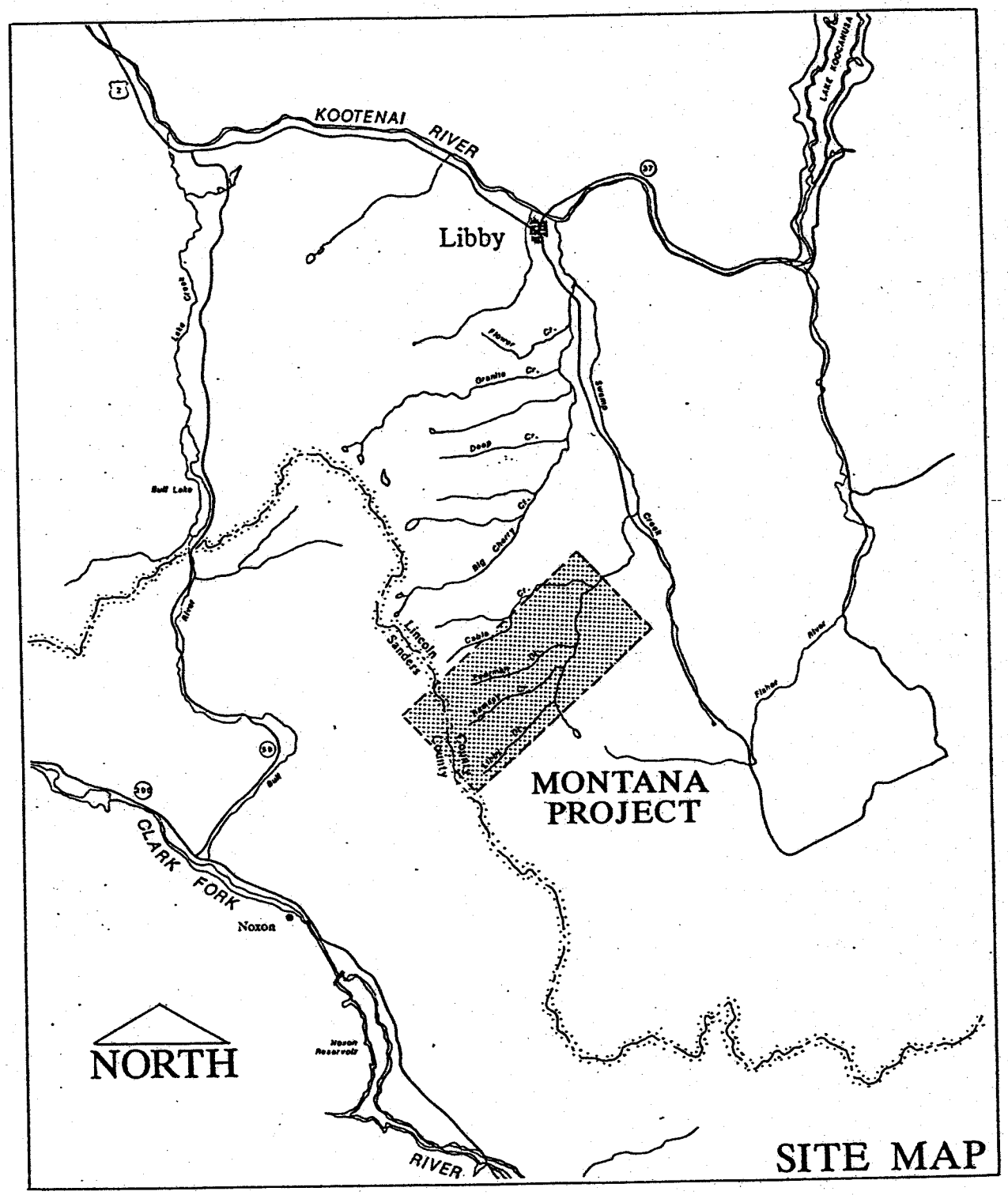
LOCATION	SOUND LEVEL (dBA)
CONCENTRATOR BUILDING (BALL MILL)	60.5 - 61.5 @ 50 FT 54 - 58 @ 200 FT
SECONDARY CRUSHING PLANT WITH HEAVY EQPT BACKUP HORN	47 - 53 @ 10 FT 63 @ 450 FT
OVERHEAD CONVEYOR BELT HOUSING	53 - 56 @ 15 FT
WEST EXHAUST FAN PORTAL	86 - 87 @ 100 FT 72 - 73 @ 200 FT
EAST EXHAUST FAN	93 - 97 @ 100 FT 80 - 84 @ 110 FT
CENTER ENTRANCE PORTAL	45 - 47
UNDERGROUND BLASTING	PEAK OF 54 @ 1000 FT
MAIN MINE ENTRANCE	47 - 48
WAREHOUSE AND SHOPS	45 - 47 @ 100 FT

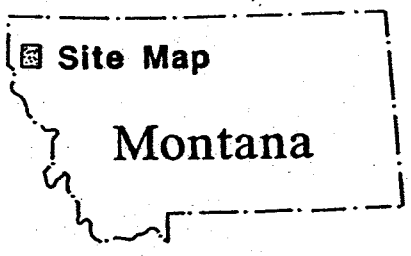
TABLE 5-1

EXAMPLES OF OUTDOOR DAY-NIGHT AVERAGE SOUND LEVELS
IN dBA MEASURED AT VARIOUS LOCATIONS

L_{dn} in dBA	Outdoor Location
135	Construction blasting
115	Solids conveyance equipment (at 3 ft) Chainsaw (operator's position)
110	Mining rock crusher (at 3 ft)
95	Earth moving equipment (at 50 ft)
80-90	Diesel locomotive (at 50 ft) Heavy trucks (at 50 ft) Chainsaw (at 50 ft)
60-80	Automobile (at 50 ft) Urban residential area
50-60	Suburban residential area
40-50	Agricultural cropland
30-40	Rural residential area Wilderness area

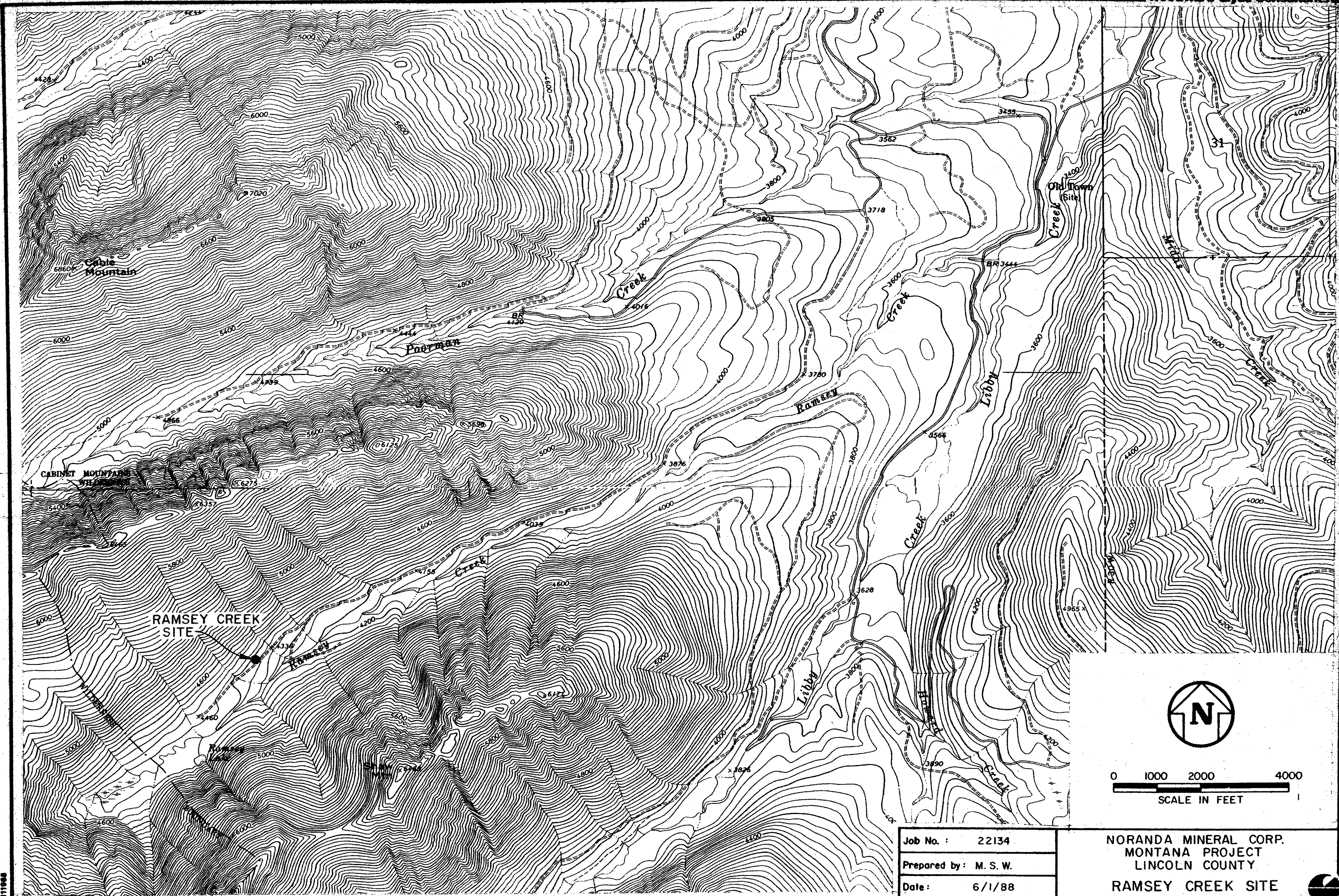
Sources: Adapted from EPA, 1977
Supplemented by Bechtel, 1981





Job No. : 22134	LOCATION MAP
Prepared by : K. B. E.	
Date : 1/31/89	

FIG. 2-1



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Prepared by :	M. S. W.
Date :	6/1/88

NORANDA MINERAL CORP.
MONTANA PROJECT
LINCOLN COUNTY
RAMSEY CREEK SITE

FIG. 3 - 1

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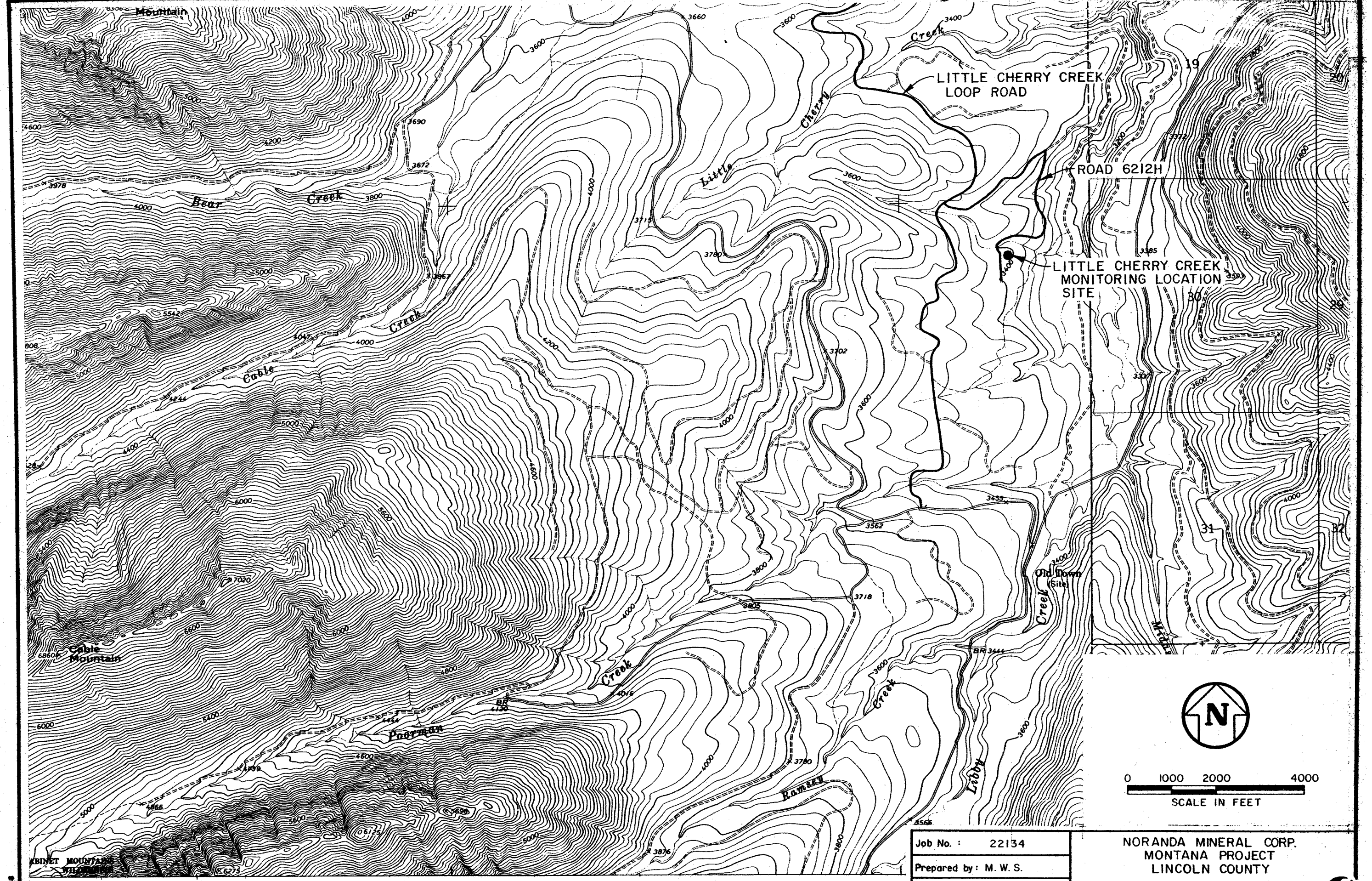

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Prepared by : M. W. S.	LITTLE CHERRY CREEK SITE
Date : 6/1/88	

FIG. 3-2

APPENDIX
SECTION 13.1 OF THE APPROVED PLAN OF STUDY

Section 13

NOISE LEVEL

Construction activities are likely to be the greatest source of noise in the proposed project area. Little audible impact is anticipated from the underground operations and mine facilities. Ventilation facilities are anticipated to generate minimal audible impacts. Noise levels on any proposed intake and exhaust vents within the Wilderness will be evaluated.

13.1 NOISE ANALYSIS

Noise levels of operating equipment including construction equipment, haul trucks, ventilation equipment and activities in the portal, facilities and tailings disposal areas will be predicted and described. Predicted noise levels will be compared to existing noise levels and the effects of increased noise on potentially sensitive wildlife habitat, including elk calving areas and grizzly bear denning sites, will be evaluated.

Noise levels from mining activities can be expected to vary considerably over time, including the amount of time a specific decibel (db) level is exceeded. Impacts to wildlife will be a function of both the total sound level and the frequency of occurrence. For example, a high noise level that is exceeded 10 percent of the time (L10) may not be as important as a lower level that is exceeded 50 percent of the time (L50). Existing information on noise impacts to wildlife will be reviewed, and short-term impacts of construction noise as well as noise associated with the mining operation will be evaluated.

Background noise levels will be measured with a portable Bruel and Kjoer Type 2209 Impulse Precision Sound Level Meter or equivalent equipment. Background noise level will be established by taking decibel readings in the proposed permit area at the plant site and air intake and exhaust portal locations. Projected noise emissions from construction, ore hauling, and mine equipment will be obtained from published literature, manufacturers specifications, and measurement of similar equipment, if necessary. A tabulation of noise levels produced by anticipated mining equipment will be prepared. Noise level data from the Troy mine will be utilized, when applicable. Local topography, vegetation and mitigation methods will be considered in the evaluation of noise impacts.

A specific focus of this work will be to understand the potential relationship of noise to wildlife usage peripheral to

the area. The issue of grizzly bear disturbance in the fall will be evaluated to develop mitigation plans (if necessary). Baseline frequency distribution will be described.

The following noise survey is proposed to collect daytime averages and nighttime averages. The plant and the tailings sites on Ramsey Creek and Little Cherry Creek will be surveyed four times, one weekday day, one weekday night, one weekend day and one weekend night. The noise meter will be operated for 1/2 hour at each site during the four test periods. The survey will be performed in June or July.

ASARCO's Rock Creek baseline data and noise data from the Troy Mine will be compared to the Borax data.