

Appendix B.7:
SBP Associates, Inc Noise Technical Memorandum

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Review of ZAVORAL MINING AND RECLAMATION PROJECT NOISE ASSESSMENT by David Braslau Associates, Inc., February 15, 2011

The Task goals of the EIS related to Noise were:

Task Goals

1. Describe Noise Regulations/Policy
2. Quantify Noise Impacts at Noise Sensitive Receptors in Project Area relative to Noise Regulations /Policy

Tiller Corporation contracted with David Braslau Associates, Inc. (Braslau) to prepare a noise assessment to provide information for this Task. AECOM contracted with SBP Associates (SBP) to complete a critical review of the Braslau report to determine if it met the goals of the Task and to evaluate technical accuracy.

Braslau Report Review and Summary

Noise impacts for the Project were evaluated in the February 15, 2011 Zavoral Mining and Reclamation Project Noise Assessment prepared for the Tiller Corporation by David Braslau Associates, Inc. (Braslau study).. The study uses mining equipment noise data from other similar operations and Minnesota truck noise emission limits to model noise impacts from on-site operations at 15 Project area noise receptors. SBP agreed that this is an appropriate methodology.

The impacts were compared to Minnesota Noise Rules and National Park Service policy for the St. Croix Wild and Scenic Riverway.

State of Minnesota Noise Regulations

Minnesota State noise standards have been established specifically for daytime and nighttime periods. The Minnesota Pollution Control Agency (MPCA) defines daytime as 7:00 a.m. to 10:00 p.m. and nighttime from 10:00 p.m. to 7:00 a.m. For residential land uses including apartments, churches, and schools (Noise Area Classification 1 or NAC-1), the Minnesota State standards for L₁₀ are 65 dBA for daytime and 55 dBA for nighttime; the standards for L₅₀ are 60 dBA for daytime and 50 dBA for nighttime. For recreational land uses other than designated camping and picnicking areas (NAC-2), the Minnesota State Standards for L₁₀ are 70 dBA for daytime and nighttime; the standards for L₅₀ are 65 dBA for daytime and nighttime. Minnesota State Noise Standards are shown in *Table 1*.

TABLE 1

MINNESOTA STATE NOISE STANDARDS

MPCA State Noise Standards					
Land Use	Code	Day (7 a.m. – 10 p.m.) dBA		Night (10 p.m. – 7 a.m.) dBA	
		L ₁₀ of	L ₅₀ of	L ₁₀ of	L ₅₀ of
“Residential”	NAC-1	L ₁₀ of 65	L ₅₀ of 60	L ₁₀ of 55	L ₅₀ of 50
“Commercial” (Includes recreational areas other than designated camping and picnicking areas.)	NAC-2	L ₁₀ of 70	L ₅₀ of 65	L ₁₀ of 70	L ₅₀ of 65
“Industrial”	NAC-3	L ₁₀ of 80	L ₅₀ of 75	L ₁₀ of 80	L ₅₀ of 75

Because the mine operations would be limited to operations from 7:00 am to 7:00 pm, only the daytime standards apply to the Project. Impacts to Minnesota residences in the Project vicinity will be compared to daytime NAC-1 standards. By rule, impacts to river and trail users should be compared to NAC-2 standards. However, the presence of campgrounds along the River in the potentially impacted area make use of NAC-1 appropriate for the entire River.

Wild and Scenic Rivers Noise Policy

The National Park Service has adopted policies related to maintenance of natural soundscapes in parks. The Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway (Minnesota and Wisconsin) was reviewed to identify potential concerns regarding noise levels and to identify any information on existing sound levels. Areas are classified with respect to the potential for noise level expectations of waterway uses. The area by the Zavoral Site is classified in the management plan as “Rural Residential” on the Minnesota side and “Conservation” on the Wisconsin side. These management objectives from the EIS are included below.

*Rural Residential (p.49 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway) (text in **bold** for emphasis)*

This area would provide a feeling of being on a river in a sparsely developed landscape. As in the small town management areas, the river, natural features, and man-made features would shape the riverway experience. Users would encounter no large concentrations of development or people — small numbers of people would be the rule in this area, with little or no commercial development. Residential settings would be limited to large lot development scattered along the shore and/or bluffs at a lower density than the small town or river town management areas. Natural vegetation would cover significant portions of the shoreline, with some stretches being largely undisturbed. Riverway users **could anticipate moderate noise levels**. The area would offer abundant opportunities to fish and view wildlife. There might be a few small public recreational support facilities (e.g., docks and launches) and some private docks.

Conservation (p.53 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway)

This management area would provide users with a sense of being in a natural setting. Very few signs of development, such as homes, bridges, or agricultural fields, would intrude on this largely natural scene. The river and surrounding biological communities would dominate the user experience. The shoreline would not be disturbed by the few visible signs of development. Forest management would emphasize the undisturbed appearance. This area would provide many opportunities to view wildlife, and there would be abundant opportunities for angling. Access to the river would be limited to a few public carry-in and small craft access points and a very few riparian landowner private docks. Recreational support facilities (e.g., primitive campsites, trails) would be small, limited in number, and largely screened by natural vegetation. With few access points, small numbers of people and infrequent encounters, there would be ample opportunity for quiet and solitude.

With motorized boats permitted on this portion of the river and with homes and docks along the Minnesota side of the river, the management objectives indicate that river users can anticipate moderate noise levels.

Findings

The Braslau study finds that noise impacts from on-site operations will be within Minnesota daytime Standards at Project area residential and recreational receptors. Additionally, the Braslau study concludes that the operations will be audible on the Scenic Riverway, but the level of impact will be consistent with National Park Service policy for the area.

SBP and AECOM concluded that noise levels during period of maximum noise generation from the proposed Site at receptors on the River will increase by an amount that may be perceptible to

some listeners. Additionally, since the frequency of noise generated on the proposed site would not be the same frequency as noise generated by sources on the river, mine activities may be audible even when the noise levels are below the ambient background on the river.

Impact Analysis

The analysis of noise impacts requires identification of noise receptor locations, quantification of existing noise levels at the receptor locations, determination of the noise generated by Project equipment, and prediction of the Project equipment impacts at each location.

Receptor Locations

Noise impacts have been identified at 15 locations representing noise sensitive receptors in the vicinity of the Zavoral location. These receptor locations are shown in Figures 2.1 and 2.2 in the Braslau study. Receptors 1 through 6 represent residences adjacent to the site. Receptors 7 through 9 represent some of the homes along the river. Receptor 10 represents a home in Wisconsin. Receptors 11 through 13 represent users on the river within the Scenic Riverway. Receptors 14 and 15 represent trail users along Minnesota Trunk Highway 95 (TH 95).

Existing Noise Level

The Braslau study included winter time monitoring at two locations near the border of the Zavoral site. No significant noise sources other than the highway were noted in the area. Traffic noise levels from non-peak average traffic were also predicted at all of the receptor sites taking into account the local geometry and topography which provides some shielding for traffic noise at the lower river receptor sites. Predictions of levels at the monitoring sites were in good agreement with the noise levels monitored in winter when no trucks were present. Ambient levels would be higher in summer months, so the winter ambient noise levels represent conservative estimates of ambient sound levels at each receptor location.

L₁₀ and L₅₀ levels for average non-peak summer traffic on TH 95 and TH 97 have been estimated with the MINNNOISE model assuming gravel haul trucks on TH 97 and TH 95 north of TH 97 to yield future typical hourly ambient noise levels from traffic. These model results were used to estimate background level in the river valley. A complete table of predicted L₁₀ and L₅₀ levels associated with these traffic assumptions is presented below.

Receptor	L10	L50
1	62.7	55.8
2	71.0	61.3
3	60.4	53.2
4	60.6	53.0
5	48.3	43.3
6	48.3	43.7
7	42.2	38.2
8	42.2	38.2
9	41.7	38.0
10	38.2	34.3
11	39.7	34.3
12	41.3	36.6
13	38.3	34.5
14	75.9	65.6
15	66.8	57.9

Modeled Background Noise Levels

Except for Receptor 2 near TH 97, all residential receptors have levels below or well below the Minnesota noise standards. The two receptors 14 and 15 represent recreational trails and are closer to the roadway than the other receptor sites. When adjusted for distance, the predicted levels were in good agreement with the noise levels monitored in winter when no trucks were present. The levels at receptors 14 and 15 were also well below the applicable standards for this type of recreational use.

Project Noise Sources

Excavator and Front End Loader

The Braslau study uses noise data collected at similar operations to define the noise levels generated by the excavator and front-end loader during mine operations. This spectral data for noise level at 50 feet for the excavator and front-end loader is provided in Figure 4.5 in the Braslau report.

Haul Trucks

The Braslau study uses Minnesota noise limits for older trucks for the Haul Truck Noise L_{10} . The Haul truck noise spectrum used in the modeling (Figure 4.9 in the Braslau Report) is based on this L_{10} of 82 dBA at 50 feet.

Shielding

Shielding from topography was evaluated in all mining phases and is a critical part of the impact analysis. Whenever the line of sight between an assumed source and a receptor site is blocked by topography (barrier), even by 1 foot, the noise reduction benefit is about 5 dBA and increases with increase in effective barrier height.

Shielding currently exists throughout much of the proposed Zavoral site due to past mining operations which have lowered the interior grades below the elevation of the surrounding land. Existing berms and the construction of proposed berms during initial site preparation would provide additional shielding. A 10-foot berm was assumed along the west side of the mine for all phases. Sound levels were analyzed with these berms since they are proposed as part of initial site preparations.

For a relatively short period of time, site operations would occur at the already reduced existing grades within the proposed mining area until an active mine face is established within the initial stages of Project development. Once the active face has been established, mining activities would follow the active face throughout the phase, operating in the lowest elevations of the phase or the mine floor. The mine floor elevations used for the noise assessment were equivalent to the reclamation grades, which represents a conservative approach to the analysis since the reclamation grades are not representative of the lowest mine floor elevations.

Project Impacts

Project impacts were determined by adding the impacts at each receptor location from excavator and front end loader noise to noise from haul truck travel on the site.

Excavator/Front End Loader Impacts

Braslau models the impacts at each receptor location using the noise data described above in combination with a propagation model that accounts for spectral level, distance from source to receiver, atmospheric absorption, and shielding by barriers or topography.

Impacts were determined for 16 mining receptors within each of the three mining phases.

Haul Truck Impacts

Haul truck impacts were then estimated using the MINNOISE traffic noise model for each route (route are shown in Figures 4.6, 4.7, and 4.8 in the Braslau study) within each mining phase. The average predicted impact from all routes within each phase were used in the determination of total Project impacts at each receptor location.

Total Impacts

The following table presents the maximum modeled impacts at each receptor location. It is determined by adding the maximum excavator noise level for each mine phase to the average on-site haul truck impact.

Zavoral Mine Maximum Noise Impact Summary (dBA)

Receptor	MN Standard		Phase 1		Phase 2		Phase 3	
	L ₁₀	L ₅₀						
R1	65	60	52.3	48.7	47.3	41.9	48.8	44.3
R2	65	60	54.0	49.7	50.9	44.8	51.4	45.7
R3	65	60	55.2	51.7	50.2	45.8	49.9	45.2
R4	65	60	53.0	49.5	52.5	48.9	50.2	46.2
R5	65	60	44.4	40.5	44.5	40.7	50.0	46.7
R6	65	60	44.7	41.3	53.5	49.9	45.8	42.2
R7	65	60	42.5	39.0	46.7	43.2	45.9	42.5
R8	65	60	41.9	38.4	46.7	43.2	44.3	40.8
R9	65	60	41.3	37.8	46.6	43.2	42.8	39.2
R10	65	60	35.2	31.4	37.4	33.7	37.5	33.9
R11	70	65	38.6	35.0	38.5	34.8	40.6	37.2
R12	70	65	43.9	40.7	41.0	37.4	42.0	38.6
R13	70	65	35.9	32.3	38.9	35.2	38.4	34.8
R14	70	65	56.5	53.1	48.7	43.3	51.0	46.7
R15	70	65	56.9	52.1	54.2	46.9	54.2	46.9

All projected impacts are well within the Minnesota Daytime Standards

Audibility

Based on a spectral analysis of the predicted noise level impacts and predicted ambient levels, the Braslau study determined that the operations would be audible in the Riverway.

Impacts From Haul Trucks Traveling Along Area Roadways

The Braslau report states that “Haul truck noise is evaluated from operations only **within** the site since trucks associated with the Tiller Corporation already use public roadways in the area.” SBP requested Tiller for confirmation of this assumption with MPCA and Scandia. In the response to this request, Tiller indicated truck traffic would be the same in the Project area.

Potential Mitigation

Although, the Braslau analysis found the Project impacts to be within the Minnesota standards and consistent with National Park Service policy, the analysis did assume construction of berms as part of initial site preparation.

SBP and AECOM note that the NPS policy is for no net increase in noise levels within the “Quiet Waters” area of the River. A net increase in noise levels has been predicted at maximum mining rates.

Alternatives

The L_{10} and L_{50} noise levels provided in the report are the same for Alternative 1: 5 to 10 Years and Alternative 3: 3.3 to 5 Years. Both alternatives would be conducted using the same operational plan and layout. There is no increase in intensity of daily operations under the two alternatives, since the daily extraction rate would be the same under both alternatives. The City Ordinance allows operation Monday through Friday 7:00 a.m.-7:00 p.m. Daily operations would be conducted in the same manner for both Alternative 1 and Alternative 3.

Ambient sound levels from traffic for a typical non-peak daytime period were predicted at all of the receptor locations and validated by winter monitoring at sites close to Hwy 95. These provide realistic L_{10} and L_{50} for the no-build alternative (Alternative 2).

SBP ASSOCIATES, INC.

PO Box 16587
St. Louis Park, MN 55416
Phone: 952-920-1500

Memorandum

Date: October 28, 2011

To: Chris White, AECOM

From: Steve Platisha, P.E.

Re: Existing Highway 97 Noise Impacts Near Proposed Zavoral Mine

Materials mined at the proposed Zavoral mine will be transported for processing on Minnesota Highway 97 in and around the town of Scandia. The purpose of this memorandum is to present the results of the noise monitoring and modeling assessment of existing Highway 97 traffic noise levels near the proposed Zavoral mine.

Minnesota Noise Rules

Minnesota Rules Chapter 7030 provides the Minnesota standards for noise. These standards describe the limiting levels of sound established on the basis of present knowledge for the preservation of health and welfare. These standards are designed to be consistent with sleep, speech, annoyance, and hearing conservation requirements for receivers within areas grouped according to land use activities. The Minnesota standards can be summarized as follows:

	<u>7:00 AM to 10:00 PM</u>		<u>10:00 PM to 7:00 AM</u>	
	L ₁₀	L ₅₀	L ₁₀	L ₅₀
NAC-1 "Residential"	65	60	55	50
NAC-2 "Commercial"	70	65	70	65
NAC-3 "Industrial"	80	75	80	75

The descriptor L₁₀ means the sound level which is exceeded for 10 percent of the time for a one-hour period. L₅₀ means the sound level which is exceeded 50 percent of the time for a one-hour period. Sound levels are expressed in dBA. A dBA is a unit of sound level expressed in decibels and weighted for the purpose of approximating the human response to sound.

Since the facility will not be operating prior to 7:00 am, this analysis focuses on the NAC-1 daytime standard. This standard is based on speech interference levels.

Monitoring Locations

Noise was measured at two locations along Highway 97. The first monitoring location was near the 4-way stop at the intersection of Highway 97 and Olinda Trail. The other location was near the intersection of Highway 97 and Newberry Avenue, representing a roadway section with free flowing traffic. The monitoring locations are shown in the figures in Attachment 1.

Monitoring Results

Table 1 present the results of the noise monitoring at each of the two monitoring locations along with the traffic volumes during the hour-long monitoring periods.

Table 1
Highway 97 Noise Monitoring Results - 10/20/11

Monitoring Location	Time	Distance to TH 97 Centerline	L ₁₀	L ₅₀	Cars	Medium Trucks	Heavy Trucks
M1	7:05 am to 8:05 am	80 feet	65	57	276	6	20
M2	8:24 am to 9:24 am	225 feet	63	55	242	6	24

Noise Impact Areas - Existing

Based on these monitoring results and traffic counts, SBP used the MINNOISE traffic noise model to estimate the distance from the centerline to which the noise levels would exceed the State daytime standards for residential areas.

The portion of Highway 97 to be used by the haul trucks has a 55 mph speed limit except near the town of Scandia where the speed limit is 50 mph. Using the traffic counts from the noise monitoring periods, SBP determined the extent of the area where the State daytime NAC-1 noise levels would be exceeded for properties adjacent to the 55 mph and 50 mph areas.

Additionally, the results of the monitoring at Site M1 were used to define the extent of the noise impact area near the stop sign. Table 2 presents the results of this analysis.

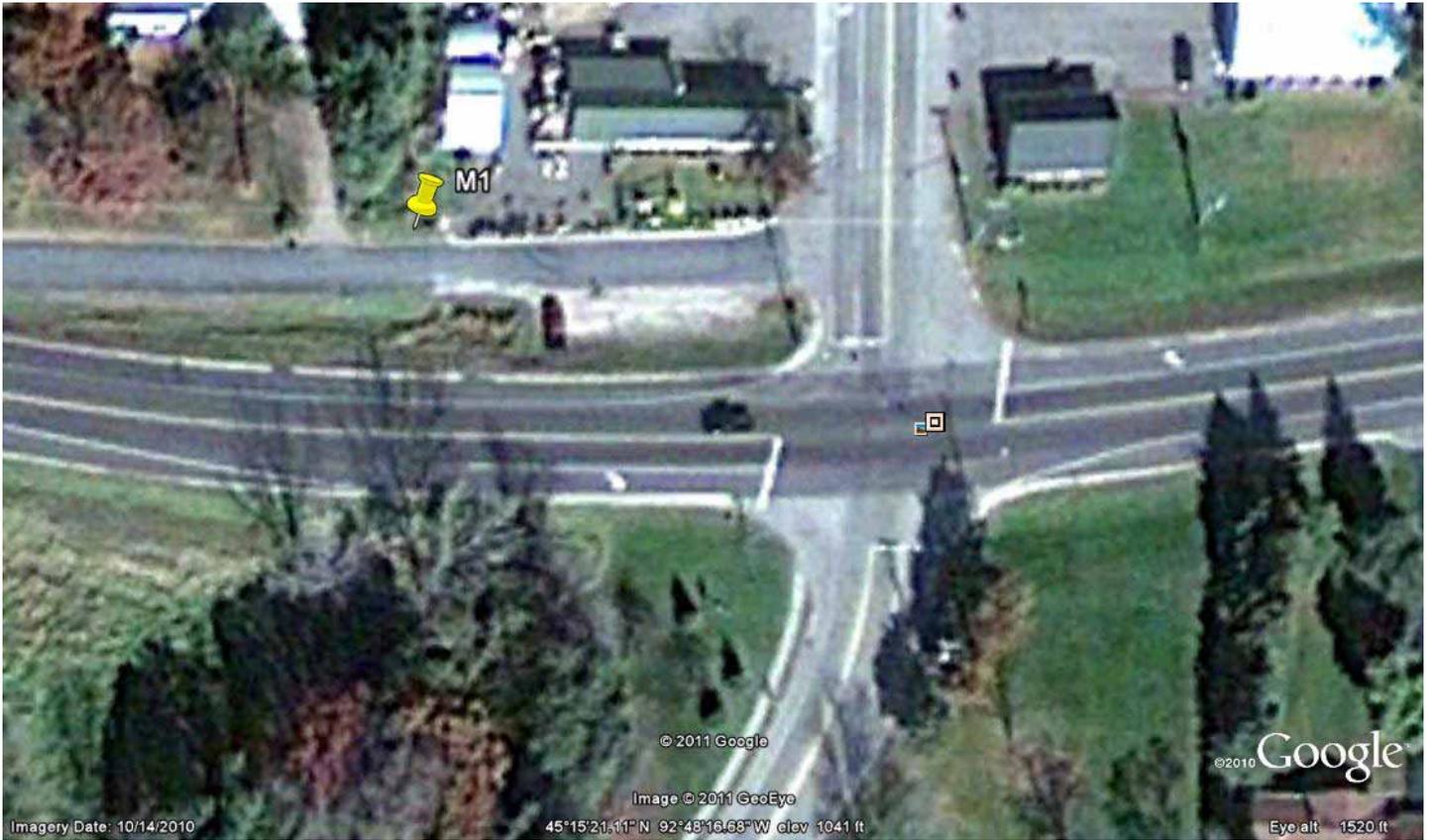
Table 2
Highway 97 Noise Impact Analysis
Existing Conditions

Area	Estimated Distance from Highway 97 Centerline to which Minnesota NAC-1 Standards are Exceeded
Properties adjacent to 55 mph speed limit areas.*	110 feet
Properties adjacent to 50 mph speed limit areas	90 feet
Properties near the Olinda Trail 4-way stop	80 feet

*The 55 mph areas were modeled with a 60 mph actual travel speed, consistent with conditions observed during the monitoring.

These estimates are based on traffic conditions observed during the monitoring periods.

Attachment A
Noise Monitoring Locations



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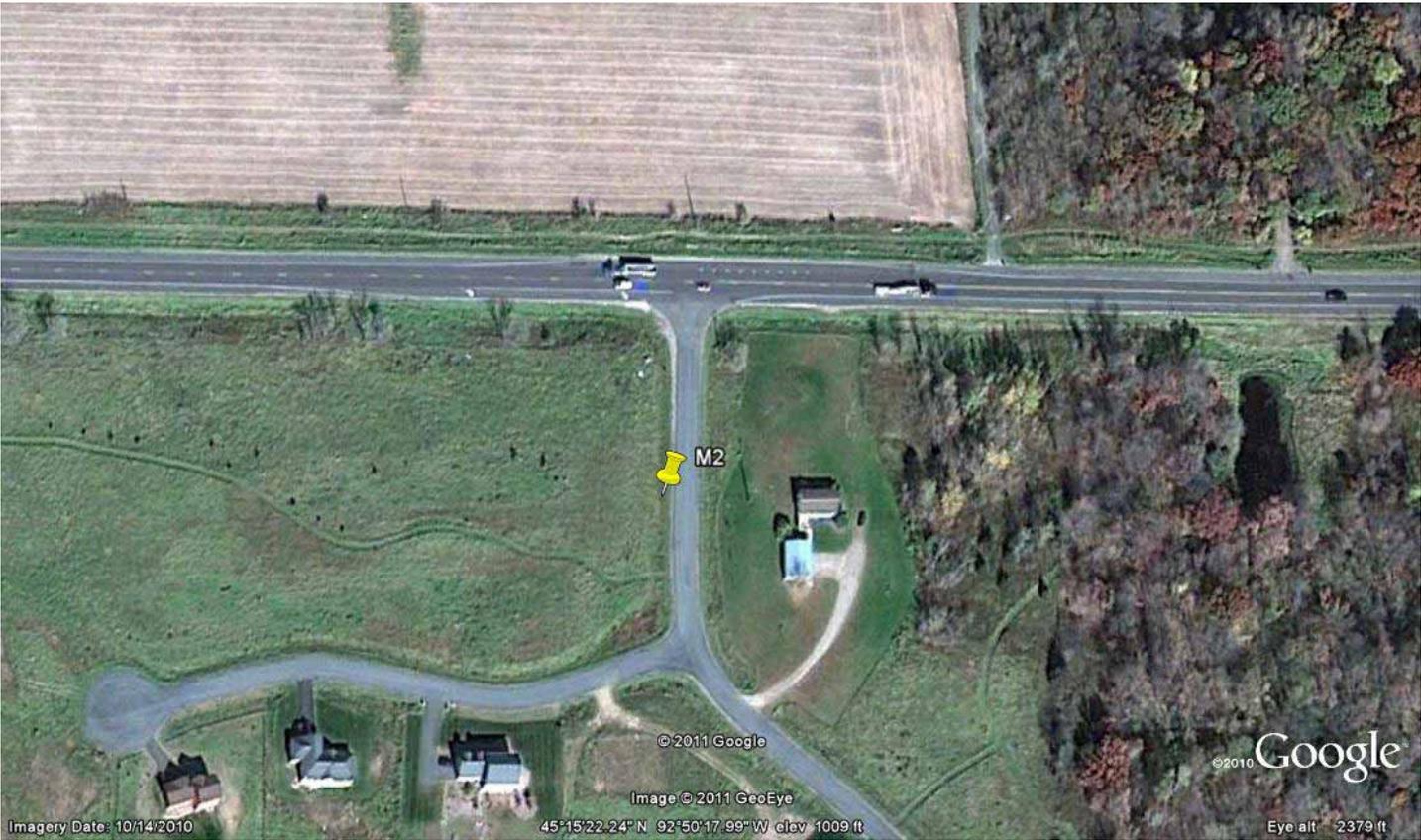
Image © 2011 GeoEye

Imagery Date: 10/14/2010

45°15'21.11" N 92°48'16.68" W elev 1041 ft

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Eye alt 1520 ft



©2011 Google

Image © 2011 GeoEye

Imagery Date: 10/14/2010

45°15'22.24" N 92°50'17.99" W elev 1009 ft

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Eye alt 2379 ft

SBP ASSOCIATES, INC.

PO Box 16587
St. Louis Park, MN 55416
Phone: 952-920-1500

Memorandum

Date: November 1, 2011

To: Chris White, AECOM

From: Steve Platisha, P.E.

Re: Calculation of Worst-Case Impacts - Comparison with Braslau Study

This report presents a simplified worst case noise analysis for mine operations impact at Zavoral mine area residential locations. These results are compared with results of the Braslau noise study.

Methodology and Assumptions

SBP used the FHWA Highway Construction Noise Model (HCNM) to predict noise levels at the nearest residential location for each of the three mining phases. The HCNM model uses a database of noise levels for construction equipment to calculate the L10 noise level at the desired receptor locations.

This analysis includes the following assumptions:

- Equipment continuously operating in the mine includes one excavator, one front end loader, and three dump trucks.
- 5 dBA of shielding between the noise sources and the residence is assumed for each phase. This represents the minimum amount of shielding that can be expected if the line of site between a source and receiver is broken by a barrier (e.g. mine face).
- The distance between the mine source and residential receiver is based on the graphics in the Braslau report. These graphics are provided in Attachment A and are marked up to show the sources and receivers used in this analysis.

The HCNM model output files are provided in Attachment B.

Results and Discussion

The following table presents the results of this analysis compared to the Braslau study.

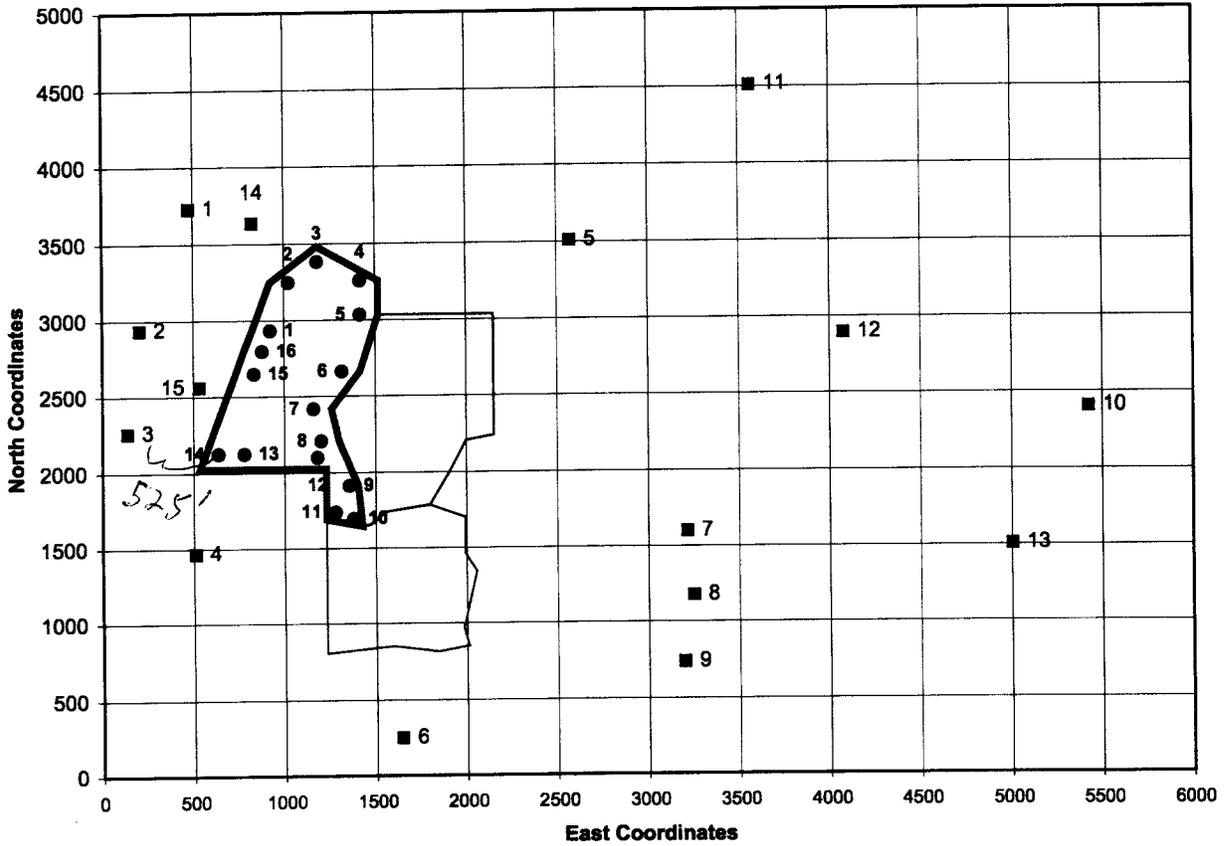
Mining Phase	SBP Worst Case L10 (dBA)	Braslau L10 (dBA)	Difference
Phase 1	58.8	55.2	3.6
Phase 2	58.5	53.5	5.0
Phase 3	56.4	50.0	6.4

Both the SBP and Braslau analyses predict mine operations noise levels within the State daytime standards (L10 = 65). This analysis shows higher results than the Braslau study. However, this is to be expected since this simplified study assumes only minimal shielding.

Attachment A
Mine Source and Receptor Graphics

Mining Sources - Phase 1

Receptors with Modeled Source Locations and Mine Face Shielding



Tiller Corporation

David Braslau Associates, Inc.

Zavoral Mining and Reclamation Project

(Scandia, Minnesota)

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FIGURE 4.2
Modeled Mining Equipment
Sources for Phase 1

550'

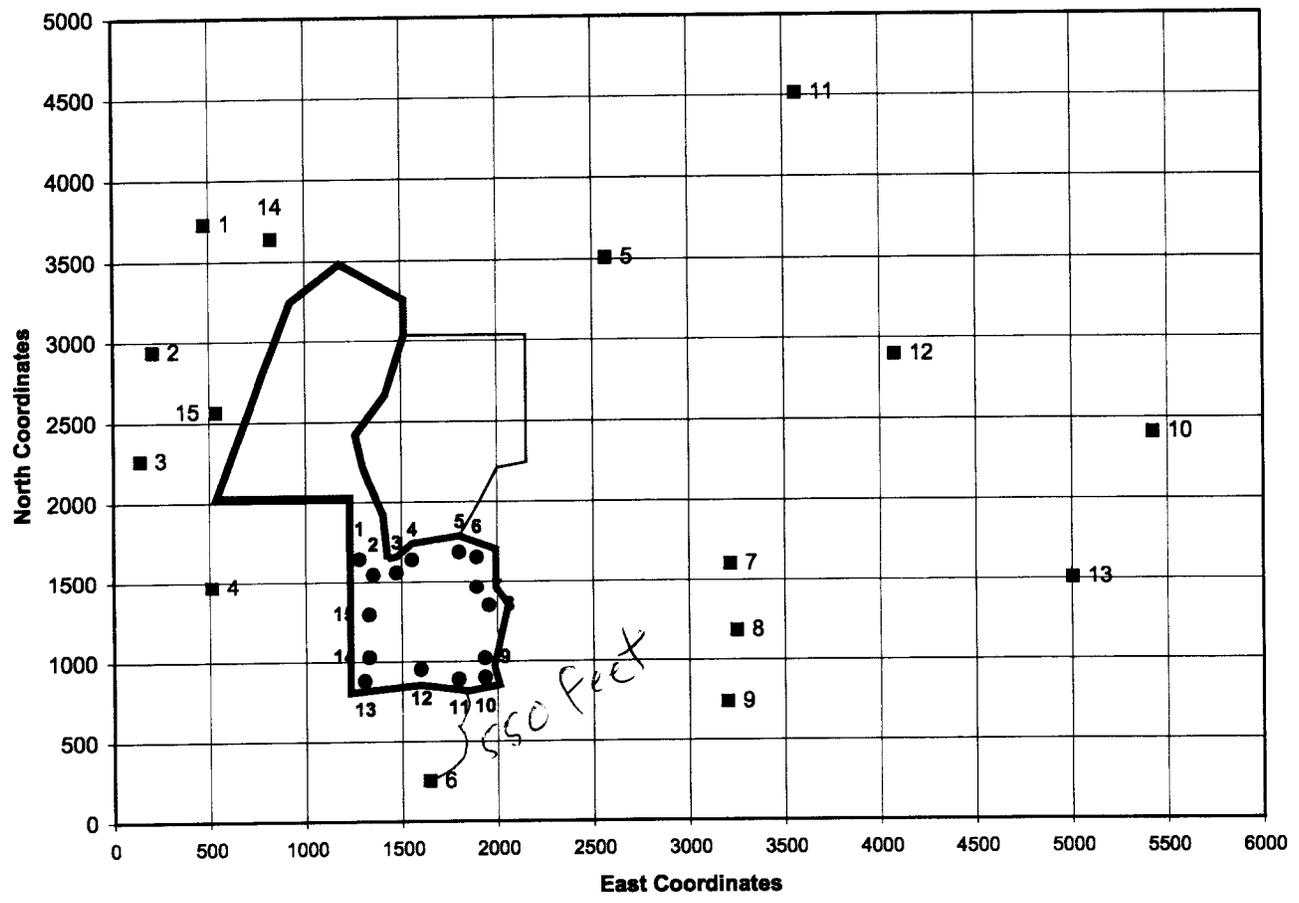
58.5 / 53.5

Noise Assessment

Tiller Corporation

Mining Sources - Phase 2

Receptors with Modeled Source Locations and Mine Face Shielding



Tiller Corporation

David Braslau Associates, Inc.

Zavoral Mining and Reclamation Project

(Scandia, Minnesota)

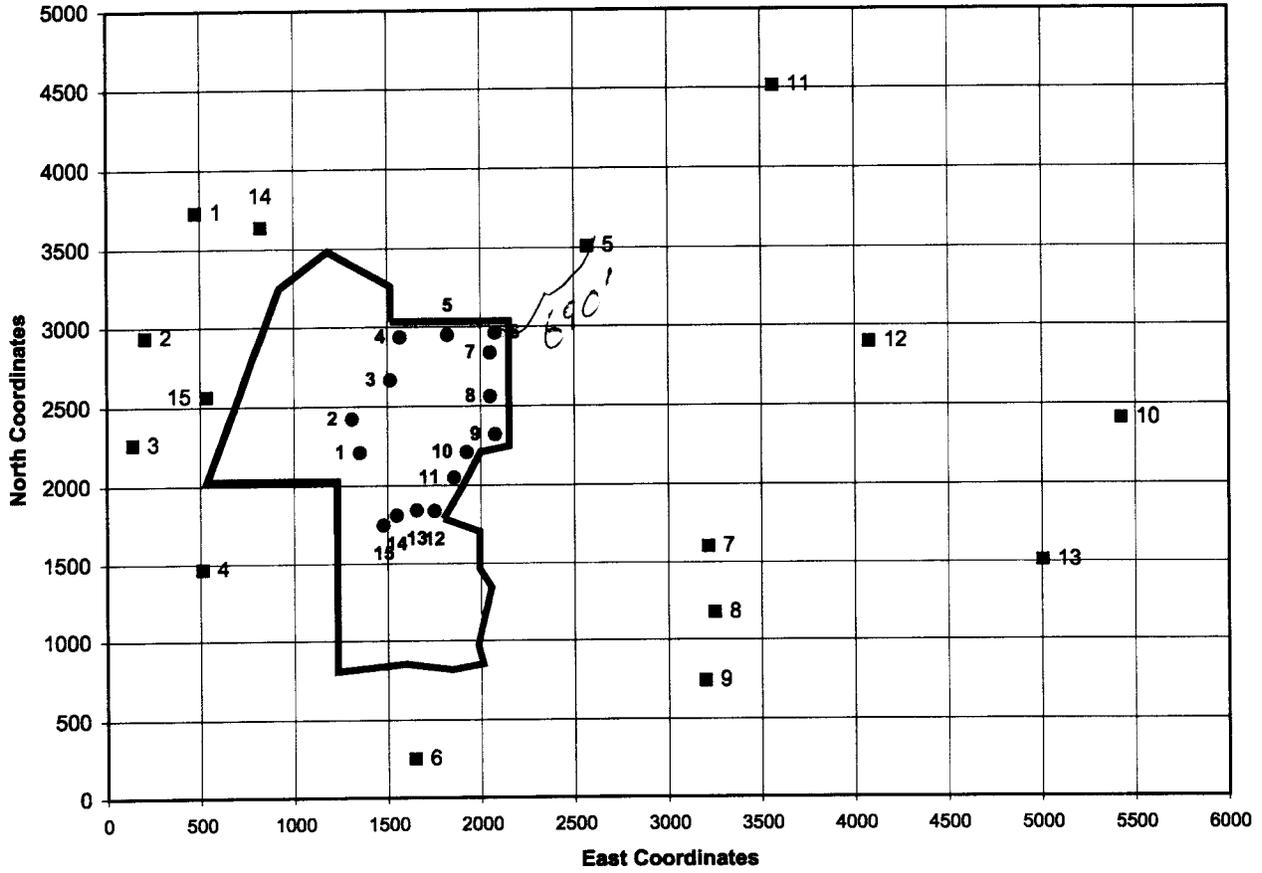
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FIGURE 4.3

Modeled Mining Equipment Sources for Phase 2

690° 56.4/10.0

Mining Sources - Phase 3 Receptors with Modeled Source Locations and Mine Face Shielding



Tiller Corporation

David Braslau Associates, Inc.

Zavoral Mining and Reclamation Project

(Scandia, Minnesota)

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FIGURE 4.4

Modeled Mining Equipment Sources for Phase 3

Attachment B
HCNM Noise Model Output

