

Mr. Damian Peduto
La Plata County
1060 E. 2nd Ave.
Durango, CO 81301
970.382.6438
Damian.Peduto@co.laplata.co.us

Mr. Daniel Murray, AICP
Senior Planner
La Plata County
1060 E. 2nd Ave.
Durango, CO 81301
daniel.murray@co.laplata.co.us

Members
La Plata County Commission

By email and United States Mail

May 10, 2016

Noise Study: GCC - King II Coal Mine Class II Permit #2012- 0089

Dear Damian, Daniel, and Members of the County Commission:

These are comments I am submitting on behalf of our client, Crosscreek Ranch LLC, with regard to the pending land use permit application for GCC Energy. These relate specifically to the noise issue.

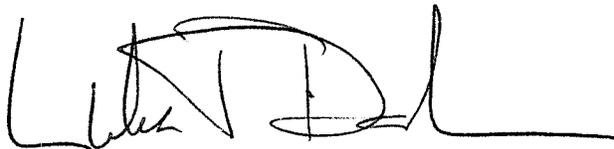
As you know, this applicant was advised on August 5, 2010 that it was operating in violation of local land use laws and needed to get into compliance. We are now almost six years later, during which time this large multinational corporation has continued to offload the costs of doing business onto local residents.

My points are simple:

1. As this study shows, there is no real doubt that the noise impacts of truck traffic on CR120 North should be regarded as "severe" at a number of locations.
2. The Department of Housing and Urban Development noise guidelines referred to in the applicant's studies are designed for noise abatement in dense urban areas and are not suitable for use in this rural setting. *"The Federal Transit Administration (FTA) noise impact framework, which is applicable to both rail and highway transportation, was designed to protect both rural and urban areas with greatly varying background noise levels,"* and is much more appropriate in this setting.
3. *"Noise barrier design is a complex process requiring tradeoffs among a number of factors. These include compatibility with the rural environment, resident input on visual impact and potential for shadowing, and reasonable property access."* Local residents need help, in the form of independent technical advice, if they are going to be able to deal with these complexities.
4. Despite the various efforts to measure noise to date, all studies done have meticulously avoided doing any monitoring at the location where local residents report that the noise is most severe and problematic, the top of the 9% grade.
5. The company's proposal is not compatible with other surrounding land uses and is therefore not consistent with the "compatibility" requirements of the Land Use Code. Nor is it adequately mitigated.
6. Any approval of any version of this application needs to be accompanied by adequate ongoing noise monitoring.

Please let me know if any of this is unclear or requires further discussion.

Sincerely,

A handwritten signature in black ink, appearing to read 'Luke J. Danielson', with a long horizontal line extending to the right.

Luke J. Danielson

cc: Crosscreek Ranch
SW CO Advocates
Jeff Robbins, Esq.
D. Adam Smith, Esq.

**King II Coal Mine
La Plata County, Colorado**

**Haul Truck Noise
Impact Assessment**

Prepared for

Law Offices of
Luke J. Danielson, P.C.

by

David Braslau Associates, Inc.

10 May 2016

EXECUTIVE SUMMARY

While potential noise impacts on all of the residential land uses along CR120 have not been assessed, this report indicates that haul truck traffic can create severe noise impacts for some residences along the route.

A range of documentation on haul truck noise along CR120 was reviewed. This report is based primarily on the Aimone-Martin report and the WAVE Engineering report and appendices. I have reviewed all of the reports and studies listed in section 1.3 of the report.

I find the HUD Noise Guidelines used in the WAVE Engineering report to be inappropriate for evaluation of noise impacts in this sparsely populated area since these were specifically developed for use in highly populated and dense urban areas and not rural areas such as that being addressed here.

We have used instead a noise impact framework developed by the US Department of Transportation. The Federal Transit Administration (FTA) noise impact framework, which is applicable to both rail and highway transportation, was designed to protect both rural and urban areas with greatly varying background noise levels. This widely applied framework appears to be most appropriate for the haul truck noise issue along CR120.

Comparing the Ldn (24-hour day-night sound level average) model predictions contained in the WAVE Engineering report with the FTA criteria (Figure 3.1 in the report), 2015 haul truck traffic is seen to have a severe noise impact at measurement sites M1, M3 and M3 and a moderate noise impact at site M2. A reduction of 12 dBA would be needed to bring the 2015 level of impact down to a "No Impact" level. Based upon the Wave Engineering report, the level of impact at each of these sites could continue to increase by about 1 dBA in 2017 and 2 dBA in 2020. Levels of this severity would certainly require mitigation if this project involved federal funding, and should be seriously considered by La Plata County when permitting this operation.

In addition to some noise mitigation measures already implemented, a feasible measure to reduce noise impacts would be limiting truck traffic and truck volumes to daytime hours.

However, noise barriers can be a very effective measure to mitigate noise from haul trucks when appropriately designed for each impacted residence. Additional background noise studies will be needed at more residences along the roadway to provide a basis for establishing the level of noise impact along the route. Noise barrier design is a complex process requiring tradeoffs among a number of factors. These include compatibility with the rural environment, resident input on visual impact and potential for shadowing, and reasonable property access.

Table of Contents

1.0	INTRODUCTION	1
1.1.	Study Description	1
1.2.	Study Objectives	1
1.3.	Documentation Reviewed	1
2.0	REVIEW OF REPORTS	3
2.1.	Aimone-Martin Report	3
2.2.	WAVE Engineering Report.....	3
2.2.1.	Sound Level Monitoring	3
2.2.2.	Sound level modeling	3
2.2.3.	Applicability of HUD Guidelines	4
2.2.4.	Mitigation Analysis	4
3.0	HAUL TRUCK NOISE IMPACTS REVISITED	5
3.1.	Colorado Revised Statute: 25-12-103 Maximum Permissible Noise Levels	5
3.2.	Federal Transit Administration Impact Guidelines	6
3.3.	Possible Mitigation Measures	9
3.3.1.	Truck retrofit and operation	9
3.3.2.	Speed Reduction.....	9
3.3.3.	Daytime Trucks Only	12
3.3.4.	Noise Barriers.....	12
3.3.5.	Window Retrofit and Exterior Envelope Treatment	12
4.0	CONCLUSIONS AND RECOMMENDATIONS	13

List of Figures

Figure 1.1 **General Study Area Addressed in this Report (Source: Google Earth) 2**
Figure 3.1 **Noise Impact of Haul Trucks 7**
Figure 3.2 **Speed versus Pass-By Sound Level (M1 – M4)..... 10**
Figure 3.3 **Speed Versus Pass-By Sound Level (X5 – X8)..... 11**

List of Tables

Table 2.1 **Model Scenarios and Predicted LDN (dBA) sound Levels..... 4**

1.0 INTRODUCTION

1.1 Study Description

This *Haul Truck Noise Impact Assessment* presents observations from previously completed reports on haul truck noise associated with the King II Coal mine in La Plata County, Colorado, and supplemental findings related to noise impacts from haul truck noise.

Location of the study area and impacted areas along the haul truck route (CR120 between the Mine and Highway 140)) which is addressed in this report is shown in **Figure 1.1**.

This assessment is based upon a review of noise monitoring, modeling and related documentation on this issue, and does not reflect any supplemental monitoring, modeling or analysis. However, this report does rely on supplemental documentation related to noise impacts on residential land uses, especially outside of urban complexes.

1.2 Study Objectives

The objectives of the study are to evaluate and comment on previously completed studies and conclusions with respect to noise impacts from coal haul trucks on residential areas and to present findings on potential noise impacts based upon published reports and widely accepted guidelines identified potential noise impacts.

1.3 Documentation Reviewed

The following documentation provided by the Law Offices of Luke J. Danielson has been reviewed:

- Noise Assessment – King Coal Mine- Hesperus, La Plata County, CO; Engineering Dynamics Incorporated, November 2013
- Summary of Analytical Activities in Response to Neighborhood Comments in conjunction with a Permit Expansion of GCC Energy, LLC King II Coal Mine; CDS Environmental Services, LLC May 8, 2014
- Review of Noise and Vibrations from CR120 Truck Traffic and Mining Operations at the GCC Energy King LL Coal Mine; Dr. Catherine T. Aimone-Martin, August 24, 2015
- King II Coal Mine – Haul Truck Noise A – Report and Appendices, prepared by WAVE Engineering, 4 January 2016.
- Letter to Daniel Murray, AICP, from Trent Peterson, Vice President, GCC Energy dated 29 January 2016,
- Residents Presentation, author and date unknown

Because of their comprehensiveness and currency, the reports by Dr. Aimone-Martin and WAVE Engineering comprise the primary references discussed in this report.

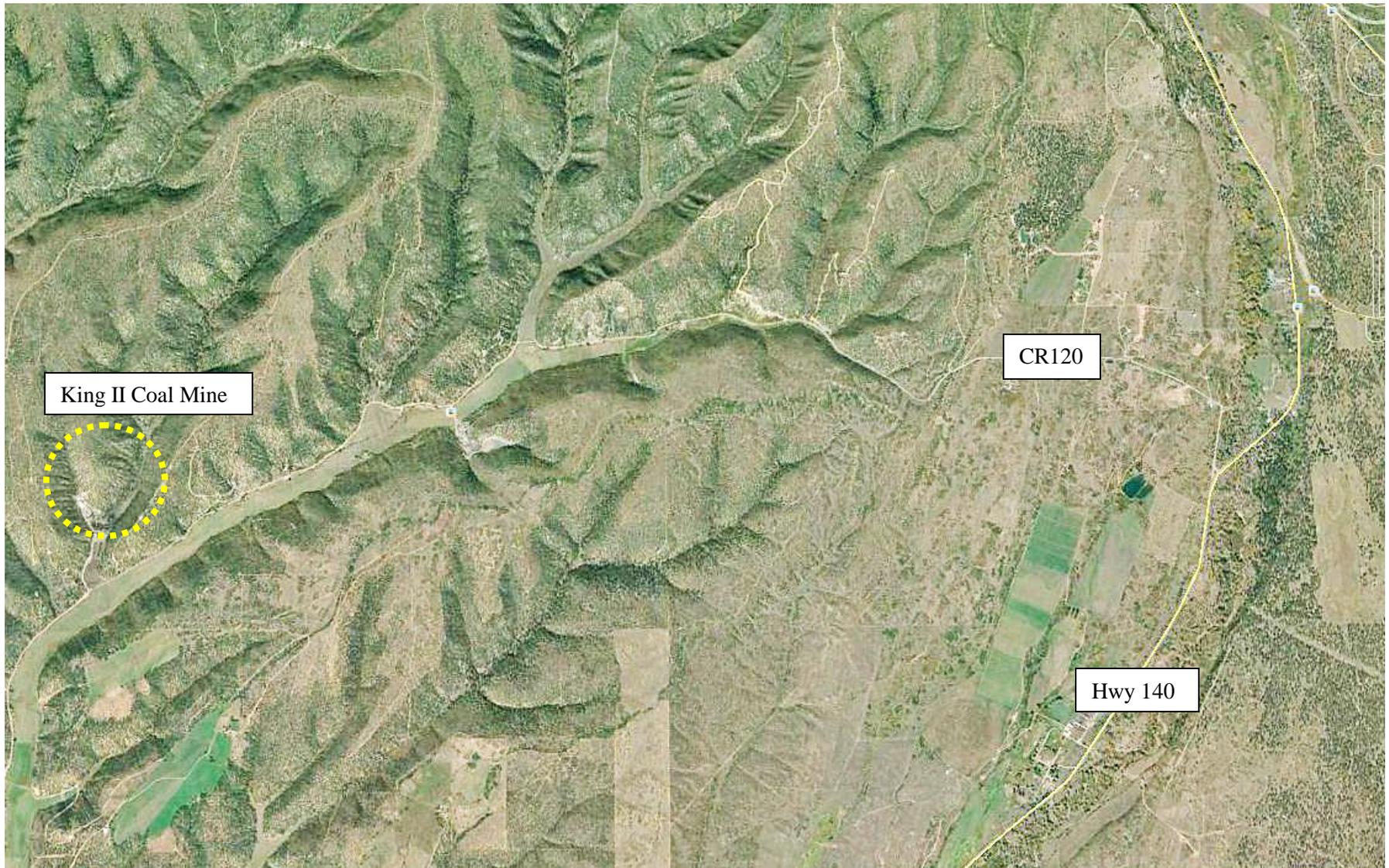


Figure 1.1 General Study Area Addressed in this Report (Source: Google Earth)

2.0 REVIEW OF REPORTS

2.1. Aimone-Martin Report

This excellent report addressed a wide range of issues associated with haul truck noise, regulations and possible mitigation methods. Because of some issues raised and series of recommendations, it is my understanding that the detailed WAVE Engineering study was performed.

While some mechanical equipment recommendations to address noise at the source are best performed by the vehicle manufacturer, some could be implemented by a fleet operator when purchasing vehicles. However, if any of the trucks are independent contractors, such mitigation would require enlisting the contractor's cooperation. Some operational measures to reduce noise could be implemented immediately such as elimination of engine braking which may have been proposed or implements. Appropriate maintenance of engines could also be checked. ,

2.2. WAVE Engineering Report

This very comprehensive report, involving sound level monitoring and modeling, provides detailed information for evaluating potential noise impacts from haul truck traffic.

2.2.1. Sound Level Monitoring

Monitoring of background sound levels and individual truck pass-by levels was undertaken in response to issues raised in the Aimone-Martin report.

2.2.2. Sound level modeling

The CadnaA model was used to model traffic noise, which is not normally acceptable for highway noise studies that require Federal Highway Administration (FHWA) approval. Most federal and state traffic noise guidelines also use hourly traffic levels rather than 24-hour average sound levels and weighted day-night (Ldn) levels such as those used for airports. Use of 24-hour averages does not accurately reflect traffic peaking and hourly variation that is normally associated with highway noise concerns. However, when critical nighttime traffic occurs, the 24-hour average can be more meaningful. The Traffic Noise Model (TNM) is used in most states and has been shown to more accurately predict the L10 and L50 metrics required in the state noise standards. However, since the CadnaA model is used to compare sound level *differences* for various numbers and types of vehicles, the German traffic noise model used by the CadnaA program probably provides reasonable results.

The model scenarios evaluated are described in the excerpt from the WAVE Engineering report:

“Scenario 1 is the background scenario and includes background traffic but no traffic associated with the mine.

Scenario 2 through 6 assume that 80% of the coal hauling trucks run from 6:00 am to 10:00 pm based on information from GCC Energy. Since we define daytime as 7:00 am to 10:00 pm, we estimate that 75% of the haul trucks run from 7:00 am to 10:00 pm. In other words, 25% of the total haul truck trips are at night (10:00 pm to 7:00 am). We assumed that all non-mine trucks run during the day.

Scenario 7 assumes the same number of trucks as Scenario 2, but all of the haul trucks run during daytime hours and not run at night”

The model scenarios and traffic volumes assumed for each scenario are shown in **Table 2.1**. Also included in the table are predicted and measured “background” sound levels for sites M1 through M4 (where background monitoring was performed), the predicted sound levels for sites M1 through M2, and increases in sound level above the background level.

Table 2.1 Model Scenarios and Predicted LDN (dBA) sound Levels

Assumed Daily Trips		1	2	3	4	5	6	7
Background traffic		323	323	323	323	323	323	323
Mine Traffic-NonTrucks			300	300	300	300	300	300
Mine Haul Trucks			180	240	310	160	200	180
			2015	2017	2020	Prop cty limit	Prop cty limit	2015 daty
			75% DAY	75% DAY	75% DAY	75% DAY	75% DAY	100% DAY
			25% NIGHT	25% NIGHT	25% NIGHT	25% NIGHT	25% NIGHT	
Measured/Predicted LDN								
Scenario	MeasBkgrnd	1	2	3	4	5	6	7
M1								
Predicted	53.0	54.4	65.0	66.1	67.0			61.3
Increase over background (Note 1)			12.0	13.1	14.0			8.3
M2								
Predicted	41.5	40.8	51.4	52.4	53.4			47.6
Increase over background (Note 1)			9.9	10.9	11.9			6.1
M3								
Predicted (note 2)	52.2	55.1	64.7	65.6	66.6			61.5
Increase over background (Note 1)			12.5	13.4	14.4			9.3
M4								
Predicted (note 2)	42.8	48.8	58.4	59.3	60.3			55.2
Increase over background (Note 1)			15.6	16.5	17.5			12.4

Note 1: Modeled values are compared with measured background levels per differences mentioned in Note 2.

Note 2: WAVE felt that predicted levels at M3 and M4 for Scenario 1 were probably higher than measured due to traffic assumptions.

2.2.3. Applicability of HUD Guidelines

WAVE Engineering used the US Housing and Urban Development noise guidelines (Ldn 65) to determine potential impacts of haul truck noise on the adjacent residential land uses. As noted in HUD documentation, the objective of the noise guidelines is to provide adequate protection in communities from high noise levels, i.e. levels greater than Ldn 65. The guidelines are intended for review of proposed rather than existing development in urban areas (as evidenced in the title of the Department of Housing and Urban Development), where if levels exceed 75 dBA, the project is denied HUD funding. The guidelines provide for improved building construction such as better walls and windows when levels are greater than 65 dBA. The guidelines are not intended to be de facto noise standards in low noise areas such as the situation faced here,

2.2.4. Mitigation Analysis

WAVE Engineering modeled the benefit from two noise barriers and clearly stated the limitations and effectiveness of noise barriers in variable terrain. For the two 12 ft high barriers evaluated, benefits were predicted to be 6 dBA at the Hunzeker residence and 10 dBA at the McCue residence. Realistic conclusions of the study were that noise barriers may or may not be very effective, depending up the elevation of the home relative to the roadway, limitations on barrier length and gaps for access, and distance from the roadway. It was noted that detailed

studies would be needed for each situation to determine an optimal height and length. It is important that residents benefited by these noise barriers have input into these studies.

If noise barriers are considered, I would recommend not limiting barrier height to 12 feet, although I understand that visual and other impacts of a noise barrier such as shading and blocking of views are of concern to the residents along CR 120.

WAVE Engineering modeled the benefits of a speed reduction from 35 mph to 25 mph and found a small reduction of 1.5 dBA. This is not unexpected when comparing the speed vs sound level curve for heavy trucks used in the FHWA TNM traffic noise model. Some discussion of effectiveness of speed change on sound level is also included in Section 3 of this report.

In Scenario 7, WAVE Engineering also evaluated the 24 hour day-night level (Ldn) benefit when haul trucks pass during daytime hours only. As noted in **Table 2.1** above, a reduction of 5 to 6 dBA could be achieved if there is no nighttime haul truck traffic.

3.0 HAUL TRUCK NOISE IMPACTS REVISITED

3.1. Colorado Revised Statute: 25-12-103 Maximum Permissible Noise Levels

This discussion address the Colorado limits and similar issues if La Plata adopts the regulation as written

(1) Every activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more therefrom in excess of the dB(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

Maximum Allowable Noise Levels		
Zone	7am to next 7pm	7pm to next 7am
Residential	55 dB(A)	50 dB(A)
Commercial	60 dB(A)	55 dB(A)
Light Industrial	70 dB(A)	65 dB(A)
Industrial	80 dB(A)	75 dB(A)

These are effectively “receiver” noise standards, i.e. they apply at any receiver greater than 25 ft from the noise source property. Since the regulation specifically applies to railroad right-of-way, it would appear that they would apply to trucks on a public highway if the this was a dominant source on the roadway.

Data from WAVE Engineering showed that most haul trucks exceed the 55 dBA level so did do some pickups on the roadway. This concern was raised in the Aimone-Martin report and another source. Most states with noise standards either employ an hourly Leq (average noise level) or statistical descriptors such as L10 and L50 (level exceeded 10% or 6 minutes or 50% or 30 minutes) of an hour. Without L10 and L50 data, which were probably collected by WAVE Engineering, it is not possible make any determination of exceedance of these standards.

3.2. Federal Transit Administration Impact Guidelines

Noise impact criteria were originally developed for high speed rail assessment where new tracks and associated sound levels could pass through both urban and very rural areas. These criteria were also extended to all types of transit projects including bus operations on existing highways.

The basis for development of the criteria by the US Department of transportation in 2005 is quoted below from High Speed Ground Transportation- Noise and Vibration Impact Assessment, US DOT 2005 (the same criteria and basis for development are included in the Transit Noise and Vibration Impact Assessment, US DOT 2006):

“The noise impact criteria in Figure 3-2 and Table 3-1 are base on comparison of the existing outdoor noise levels and the future outdoor noise levels from the proposed project. They incorporate both absolute criteria, which consider activity interference cause by the transit project alone, and relative criteria which consider annoyance due to the change in the noise environment cause by the transit project. These criteria were developed to apply to a wide variety of surface transportation modes, to recognize the heightened community annoyance caused by late-night or early-morning operations and to respond to the varying sensitivity of communities to projects under different background noise conditions.”

This framework can be applied to any type of development related to transportation modes, such as the current issues of haul trucks in a rural environment, not dissimilar increase bus or rail services. It is interesting to note that the Colorado noise regulation specifically includes railway rights-of-way, which are considered as industrial zones for purposes of the regulation. An extension of the criteria to very low noise areas (with background levels below 40 dBA) was described in a paper presented to the Acoustical Society of America by the author of this report, where increases over background determine impact, and not absolute sound level limits::

Can a Statewide Noise Rule Cover both Urban and Rural Areas?, David Braslau, 162nd Meeting of the Acoustical Society of America, San Diego, CA; November 2011.

For Land Use Category 2 land uses, residential areas where people sleep, the Ldn is the appropriate metric to be used in conjunction with the chart. The existing noise exposure and “project noise exposure” when no truck are present are identical and shown as starting points on the chart in **Figure 3.1**. The predicted Ldn levels from **Table 2.1** have been plotted against the existing noise exposure, both for scenarios with nighttime haul trucks and daytime-only haul trucks.

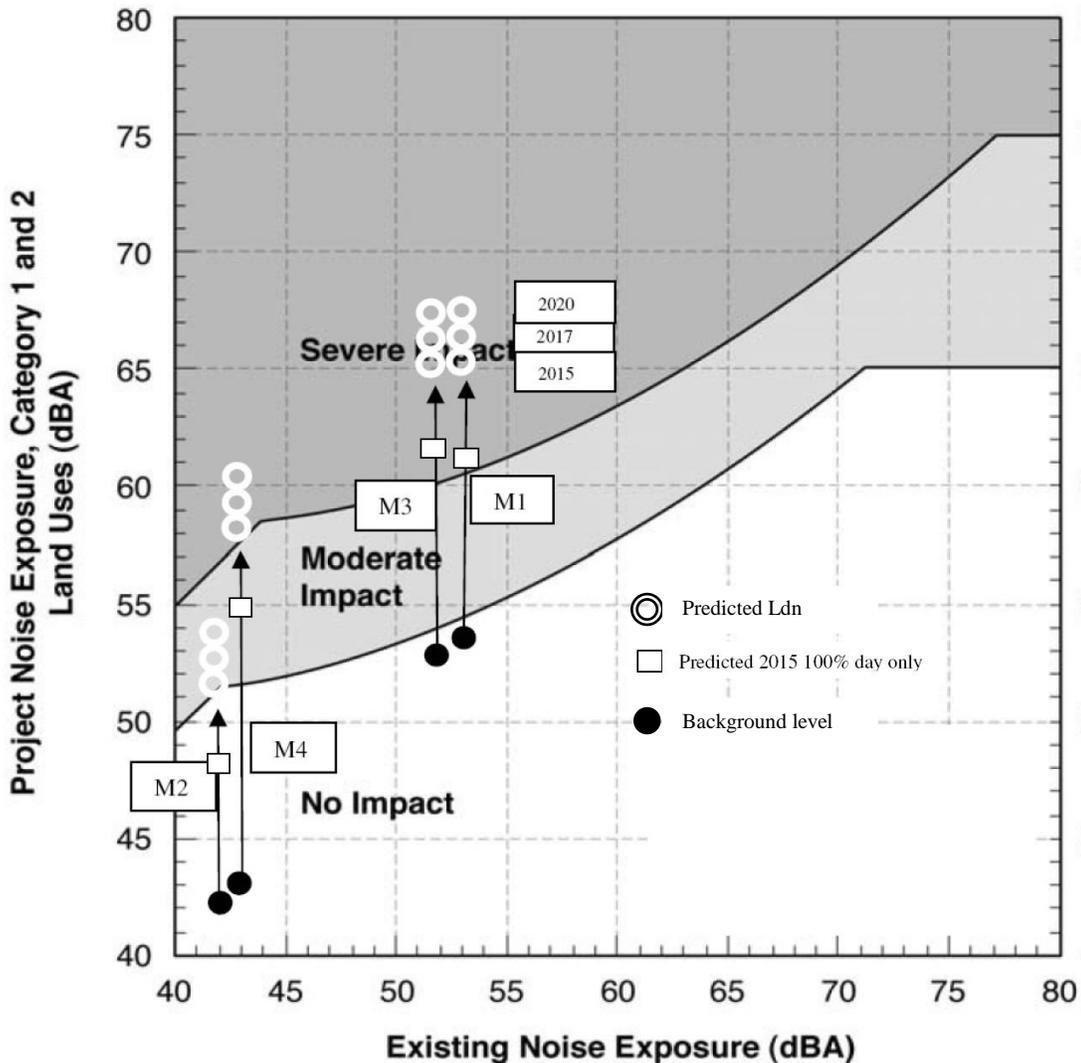


Figure 3.1 Noise Impact of Haul Trucks

As can be seen on the figure, the Ldn with 2015 haul truck activity, some at night, is seen to increase the level into the Severe Impact zone, except for M2 which is 475 feet from the roadway. The Ldn at M2 with haul truck activity still falls within the Moderate Impact zone. With no nighttime haul truck activity in 2015, a Severe Impact is still indicated for M1 and M3, no impact for M1 and a Moderate Impact for M4.

If new haul truck activity were planned, substantial mitigation would be required by the haul truck operator for approval under these guidelines. While not all of the residential land uses along CR120 are addressed here, this does provide a general indication that haul truck traffic creates severe noise impacts for some residences along CR120.

For M1 a 5 dBA reduction in the 2015 Ldn would be needed just to reduce the impact from severe to moderate, with an 8 dBA reduction needed in 2020. A 12 dBA reduction would be a

meaningful compromise, bringing the impact mid-range in the moderate impact zone. A general reduction of 8 to 12 dBA should be an objective, depending on the predicted increase over background noise from haul trucks. .

This framework can be seen as more appropriate than the absolute HUD 65 Ldn limit, which can be seen from **Figure 3.1**. As can be seen in the figure, the HUD guidelines would only be meaningful when the existing background level is just over 70 dBA

Some state noise standards limit the increase in hourly levels to 10 dBA over background or existing noise level. For example, as noted in the Aimone-Martin report:

“Noise levels for abatement consideration in the CDOT guidelines are 66 Leq at the exterior of residences.. The guidelines also state that noise abatement should be considered when noise levels “substantially exceed the existing noise levels.” This criterion is defined as increases in the Leq of 10 dBA or more above existing noise levels.”

The State of Oregon noise regulations limit the increase in noise for a new source:

(i) No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that wise source increase the ambient statistical noise levels, L10 or L50 by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule.

Although the highway is not a “new source,” the increase in haul trucks since 2010 could be interpreted to be a “new source” and more than a 10 dBA increase in level would not be permitted. Since hourly statistical data are not available but with single pass-by levels of 20 to 30 dBA over background, it is possible that an hourly increase L10 or Leq could occur. In either case, mitigation would be required under these two state regulations.

3.3. Possible Mitigation Measures

Here are some comments on noise mitigation strategies.

3.3.1. Truck retrofit and operation

As mentioned earlier in this report, the potential for equipment retrofit can have significant benefits, if contract haulers can be required to adopt them. However, as noted in the WAVE Engineering report, exhaust mufflers were understood to have been installed and “jake” or engine-breaking is not permitted.

3.3.2. Speed Reduction

As noted briefly earlier in the report, reduced truck speed from 35 mph to 25 mph is expected to yield a relatively small benefit of only 1.5 dBA. **Figure 3.2** and **Figure 3.3** are plots of measured haul truck pass-by sound levels from the WAVE Engineering report sites M1 through M4 and X5 through X8, respectively, but adjusted to a common distance of 50 feet for direct comparison. The symbols used are “G” for gravel and “P” for paved roads, followed by “E” for eastbound trucks and “W” for westbound trucks.

As can be seen from the charts, the sound level at any given speed can vary as much as 10 dBA. Some of this variation was explained in the WAVE Engineering because of different operating conditions and roadway grade. In **Figure 3.3** it can be seen that 10 mph travel on a gravel road can in some case be about 5 dBA lower than 20 mph on paved roads.

The 10 mph limit on gravel roads can provide a reasonable benefit but pass-by levels within 50 feet of the roadway could still exceed 70 dBA. Because of the varying conditions along the road, it would be difficult to set speed limits along each section, whether traveling eastbound or westbound. Therefore, other than the 10 mph limit on gravel roads, imposing a 25 mph limit on paved roads does not appear to provide much benefit.

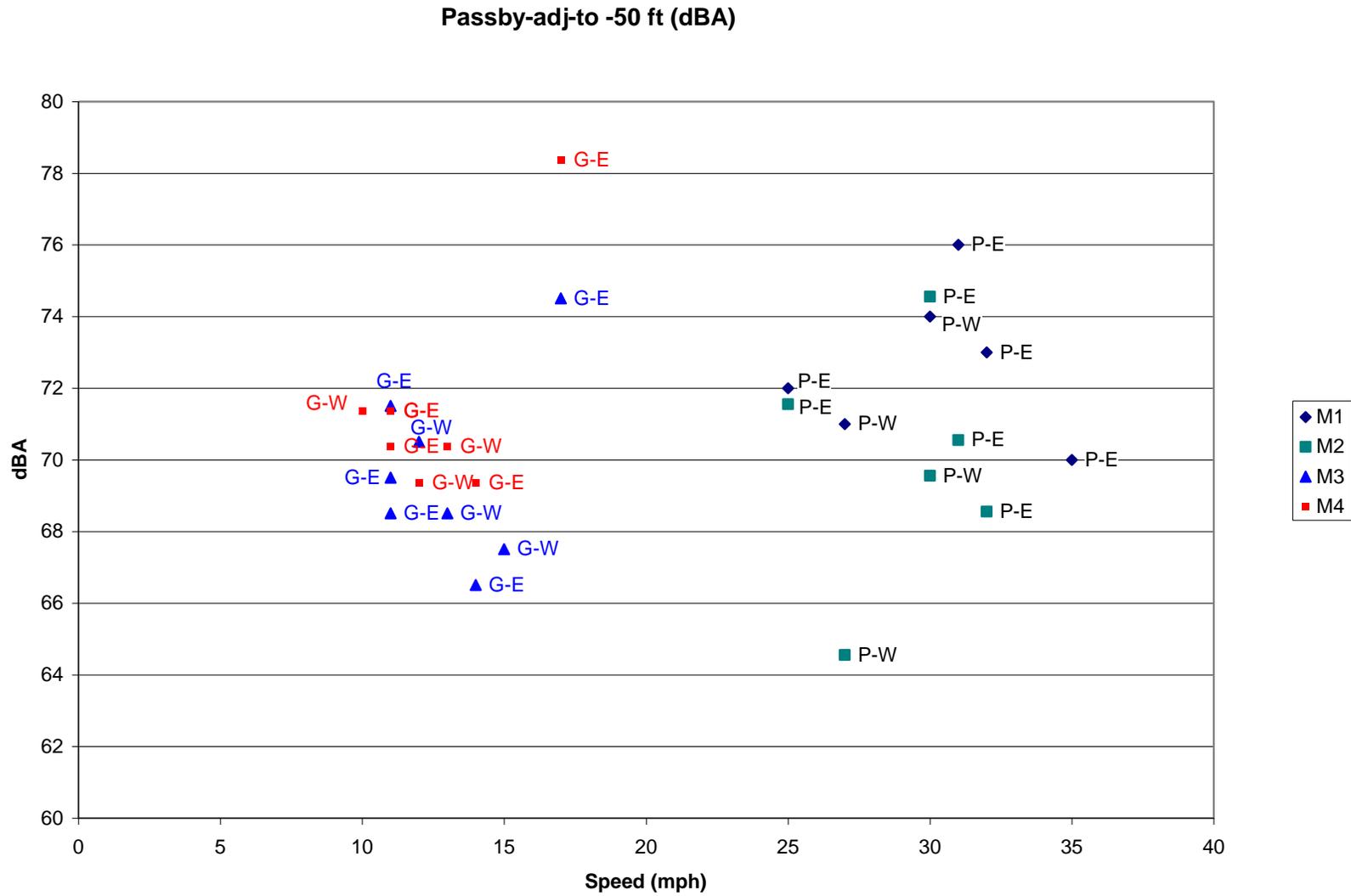


Figure 3.2 Speed versus Pass-By Sound Level (M1 – M4)

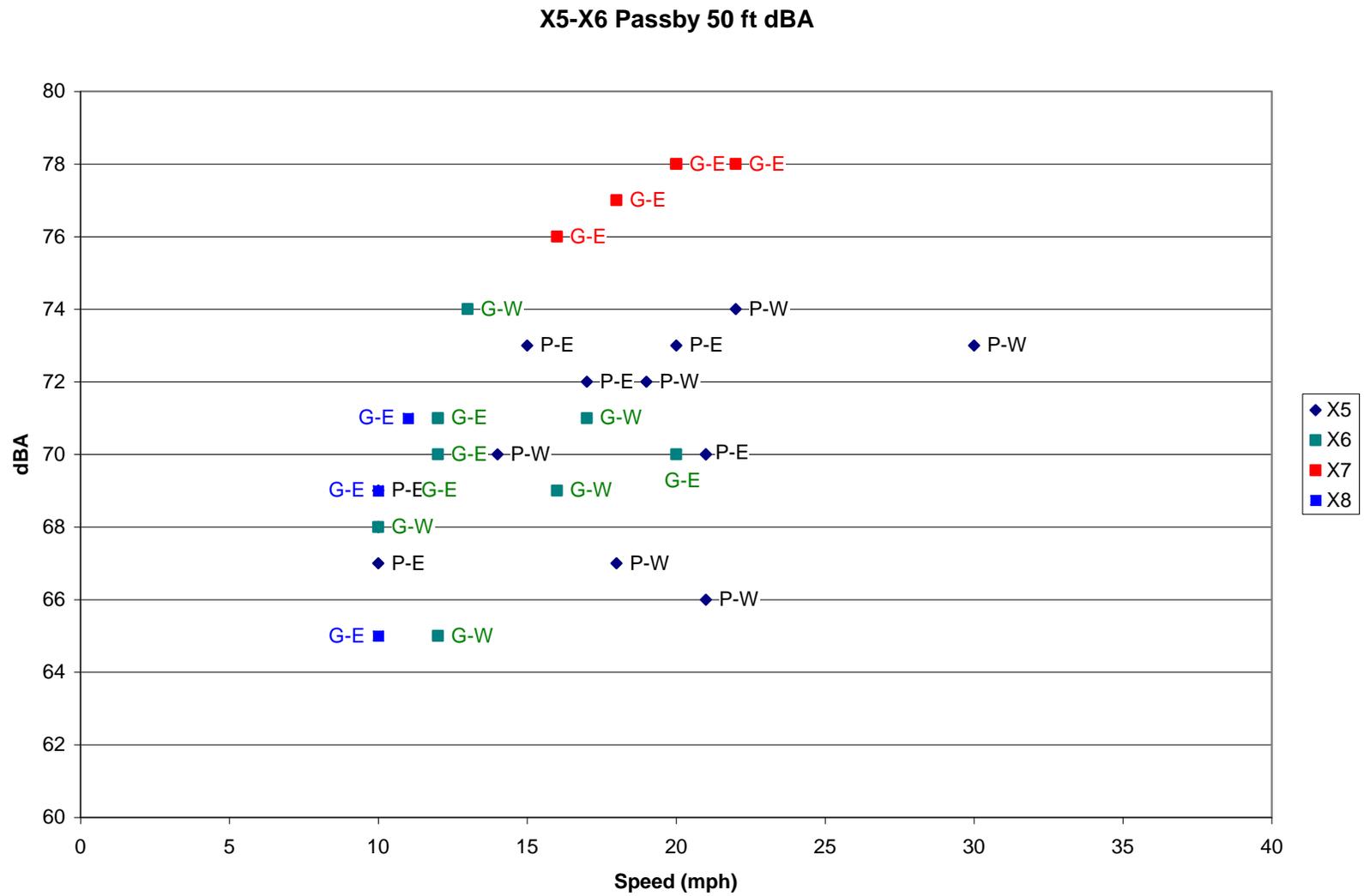


Figure 3.3 Speed Versus Pass-By Sound Level (X5 – X8)

3.3.3. Daytime Trucks Only

As noted above, Scenario 7 of the WAVE Engineering modeling analysis should show that the Ldn could be reduced by 6 to 5 dBA.

3.3.4. Noise Barriers

The analysis by WAVE Engineering showed that noise barriers can be effective, at least in some cases, for reducing noise from haul trucks. As noted in their report, a detailed analysis of noise barriers would be needed to determine where along CR120 noise barriers could be designed to provide reasonable sound level reductions and that reflective barriers should be avoided.

Based upon decades of involvement in noise barrier analysis and design, it is also clear that there are complex trade offs that need to be taken into consideration, including factors such as visual appearance, effects on shadow, wind, and snow.

3.3.5. Window Retrofit and Exterior Envelope Treatment

Finally, one mitigation approach that was not mentioned in the materials reviewed was treatment of homes to minimize exterior-to-interior sound transmission. Extensive implementation around airports has shown this to be fairly effective for reducing interior sound level but clearly has no effect on exterior levels. However, it is not known whether homes along CR120 are designed and constructed to accommodate such improvement and what the cost of these improvements might be.

4.0 CONCLUSIONS AND RECOMMENDATIONS

While potential noise impacts on all of the residential land uses along CR120 have not been assessed, this report indicates that haul truck traffic can create severe noise impacts for some residences along the route.

Documentation on haul truck noise associated with the King II coal mine was reviewed. The most substantive reports by Aimone-Martin and WAVE Engineering provided a comprehensive evaluation of the issue with extensive and reliable data in the WAVE Engineering report.

Application of the Housing and Urban Development (HUD) Noise Guidelines used in the WAVE Engineering report is inappropriate for evaluation noise impacts in this sparsely populated area since these were developed for use in dense urban areas. We have instead evaluated noise impacts within a more realistic framework developed by the US Department of Transportation, designed for both urban and rural areas. The Federal Transit Administration noise impact framework, which is applicable to both rail highway transportation, can readily be applied to non-transit issues.

With this framework, and using the Ldn (24-hour day-night sound level average) model predictions contained in the WAVE Engineering report, 2015 haul truck traffic is found to have a severe noise impact at measurement sites M1, M3 and M3 and a moderate noise impact at site M2. Based on the model predictions, the level of impact at each of these sites would increase by about 1 dBA in 2017 and 2 dBA in 2020. Levels of this severity would require mitigation for projects where federal funding is involved

The severe level of impact identified here should be noted by La Plata County and mitigation measures be included as a permit requirement. It would then be the responsibility of King II Coal to provide the needed mitigation with no financial burden on the impacted residents. The absolute 65 dBA Ldn allowable level under HUD guidelines is not appropriate here as a design goal for barrier design.

Based upon the consideration of various mitigation options, the types of measures to mitigate haul truck noise at residential land uses along CR120 appear to be limited. Based on the WAVE Engineering report, several mitigation measures have already been implemented by the mining operation, such as exhaust mufflers and a 10 mph limit on gravel roads. One of the most effective measures considered to date is limiting truck traffic to daytime hours.

However, noise barriers can be a very effective measure to mitigate noise from haul trucks if appropriately designed for each impacted residence. Additional background noise studies will be needed at more residences along the route to provide a basis for establishing the level of noise impact. While barriers mitigate sound level, noise barrier design is a complex process requiring tradeoffs among a number of factors. These include compatibility with the rural environment, resident input on visual impact and potential for shadowing, and reasonable property access. Window retrofit and other measures for reducing noise impact within homes are another measure that could be considered. All costs associated with noise mitigation are always covered by the noise generator and not those impacted by the noise.