Anchorage Rail Capacity Improvements Milepost 110 to Milepost 114 - Phase 1 Noise and Vibration Study Summary

Introduction

In 2002, the Alaska Railroad (ARR) initiated a project to investigate alternatives that would alleviate congestion and increase capacity along the mainline track from the Anchorage International Airport Spur (near Milepost 110) to the Anchorage Rail Yard (Milepost 114). This four-mile corridor is one of the ARR's most congested and is critical to improving current passenger and freight operations and in meeting projected future operations. Although freight traffic is not projected to increase substantially, passenger traffic has grown dramatically in the past few years and is projected to continue this trend. Capacity improvements would alleviate congestion and enhance safety for the ARR and the community.

The capacity improvement alternatives currently under consideration include constructing additional sidings (train passing lanes), installing automated signals and switches, and extending the double track currently under construction in south Anchorage.

Noise / Vibration Study Purpose

Because ARR is aware of noise and vibration concerns expressed by some residents along the project corridor, a noise and vibration study and public involvement activities were initiated in February 2002 as part of preliminary engineering and environmental analysis.

The purpose of the noise and vibration study is to obtain current data regarding noise and vibration along the project corridor, then to predict changes that would result from the project alternatives. The first phase of the study focused on measuring ambient noise levels and train-induced noise and vibration at selected locations during the winter, spring and summer. The objectives of Phase 1 were to identify existing conditions, seasonal variations, differences at various train speeds, and differences between freight trains and lighter passenger trains.

Results from Phase 1 of the noise and vibration study will be used in Phase 2 to predict future noise and vibration levels associated with the alternatives under consideration for capacity improvements. The results of both phases of the study will be used in environmental analysis required under the National Environmental Policy Act (NEPA) and as a guide to ARR operating practices and decisions.

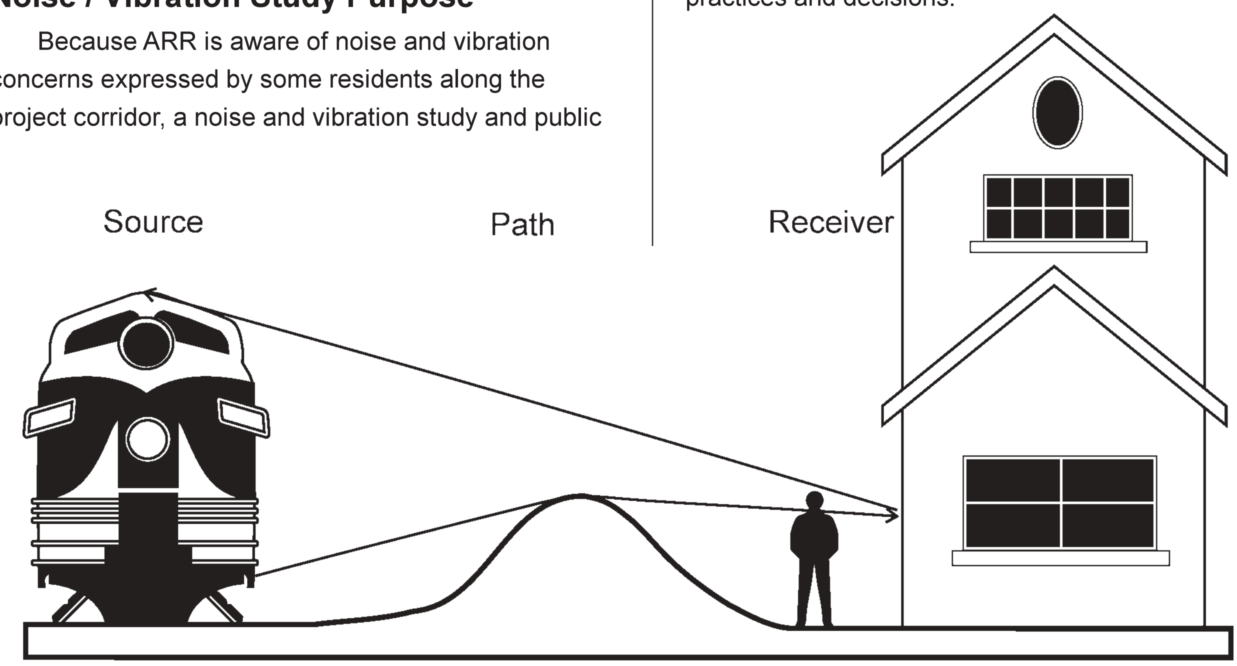


Figure 1. Noise Source-Path-Receiver

In the study, noise from trains is discussed in terms of a Source-Path-Receiver environment as shown in Figure 1. The ***source*** *is the train generating noise along the track. The noise is transmitted along a* ***path*** *between the source and the receivers. Along this path, noise is reduced by distance, obstacles and other factors. Finally the noise reaches a* ***receiver,*** *to be heard.*

N5
- Residence near Elderberry Park
- Nearest resident on north side of study
- Measure noise 60 feet from track

V4
- Residence near Elderberry Park
- Measure vibration 40, 60 and 70 feet from track

V1
- Nulbay Park, near O Street
- Measure vibration at 40, 100 and 135 feet
- Test propagation* in clay soil

N1
- ROW **, condos at 8th Ave. & Stolt Ln.
- Residential areas near north section
- Measure noise 66 feet from track

N7
- ROW** fence at gate for AWWU access
- Residential areas near north section
- Measure noise 60 feet from track

H1
- Residence at 2409 Marilane Drive
- Test house for inside & outside measures
- Measure noise / vibration at 430 feet

N2
- Fish Creek embankment on Lahonda
- Residential areas in middle section
- Measure noise 200 feet from track

V3
- Lahonda Drive
- Measure vibration 25, 75 and 100 feet
- Test propagation* in sandy soil

N8
- Back yard at 2544 Forest Park Drive
- Residential area one street away
- Measure noise 500 feet from track

N4
- ROW** fence near Lahonda Mobile Home Park
- Middle section area
- Measure noise 40 feet from track

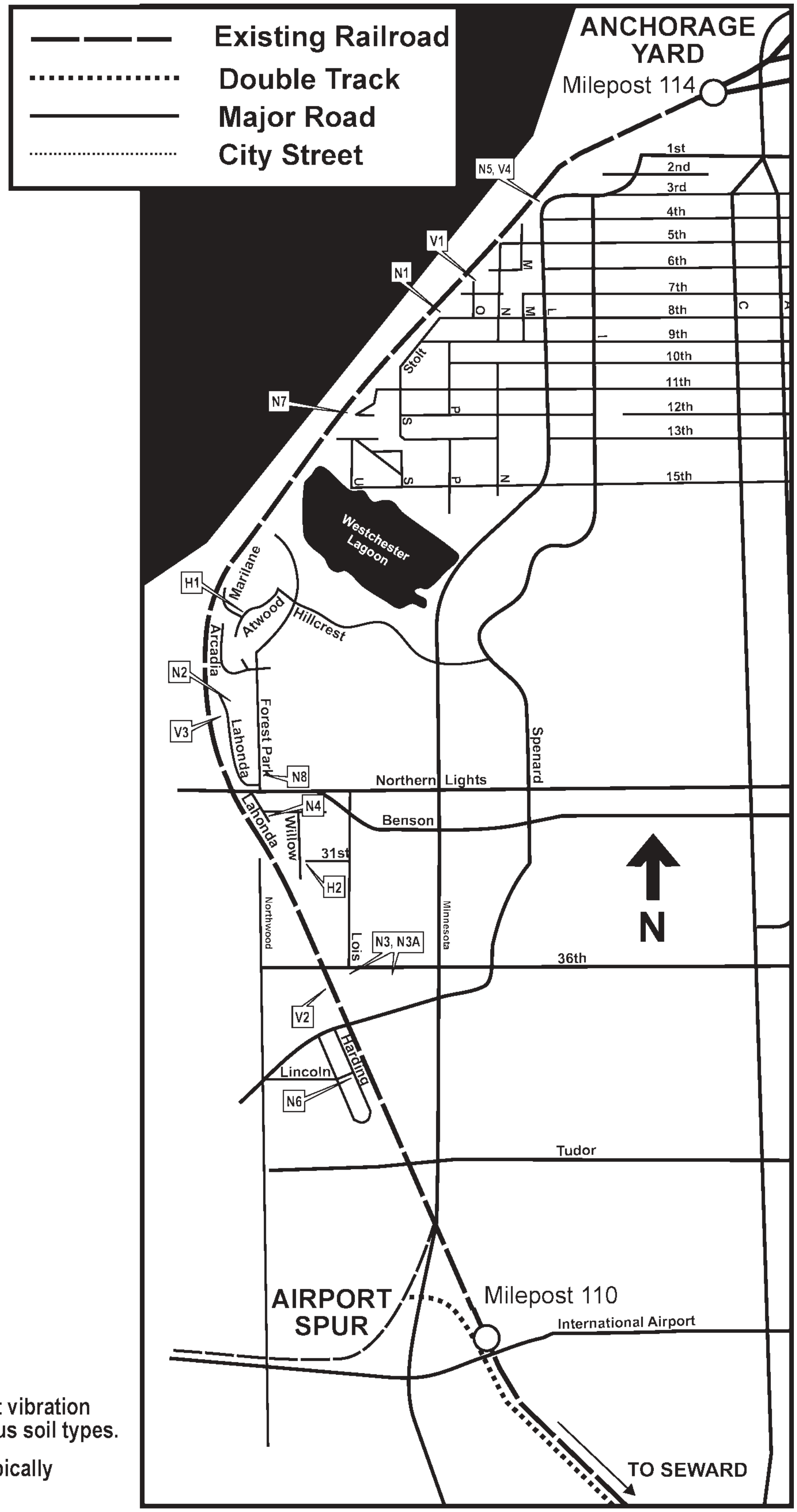
H2
- Residence on 31st Ave. at Willow St.
- Test house for inside & outside measures
- Measure noise / vibration 100 & 125 feet

V2
- Between 36th Ave. and Spenard Rd.
- Measure vibration 25, 50 & 100 feet
- Test propagation* in "old bog" peat soil

N3
- ROW** fence between 36th and Spenard
- Residential area near at-grade crossing
- Measure noise 100 feet from track

N3A
- Lois Ave. near 36th
- Residential area behind one row of buildings from N3
- Measure noise 300 feet from track

N6
- Wooded buffer area along Harding Drive at Lincoln Avenue
- South section area
- Measure noise 70 feet from track



* Propagation refers to the distance that vibration travels from the source through various soil types.

** Refers to the railroad's right of way, typically 100 feet on either side of the track.

Figure 2. Capacity Project Study Area - Noise & Vibration Test Sites

Study Methods

Harris Miller Miller & Hanson Inc. (HMMH) is conducting the noise and vibration study for the Anchorage Capacity Improvements project and is considered the premier noise and vibration control company in the transportation field. The study was conducted in accordance with the "Transit Noise and Vibration Impact Assessment" guidance manual developed by HMMH for the Federal Transit Administration (FTA) in 1995. This guidance document establishes an approach for measuring noise and vibration impacts associated with rail transit projects.

Noise from trains is discussed in terms of a Source-Path-Receiver environment as shown in Figure 1. The **source** is the train generating noise along the track. The noise is transmitted along a **path** between the source and the receivers. Along this path, noise is reduced by distance, obstacles and other factors. Finally the noise reaches a **receiver**, to be heard.

Three types of measurements were made during this first phase of the noise and vibration study:

- long term (24-hour) ambient noise at representative locations;
- reference noise levels of specific ARR equipment; and
- ground-borne vibration levels and propagation characteristics of specific ARR equipment.

Noise measurements were made using instrumentation systems that conform to American National Standards Institute standards. Ground-borne vibration was measured with accelerometers attached to the ground and noise data were collected through microphones. For the reference noise and vibration measurements, train passbys were observed to record information on locomotive types, number and type of cars, and speed.

Figure 2 shows the locations of the noise and vibration monitoring sites. Site designation prefixes generally identify the type of measurements performed: N= noise site; V= vibration site; and H= house vibration site.

Eight long-term noise measurement sites (N1 to N8) were monitored to characterize the existing ambient noise levels along the railroad right-of-way. Reference noise levels for ARR locomotives and cars were measured at two sites (V1 and V2) for use in noise prediction models during Phase 2 of the noise study.

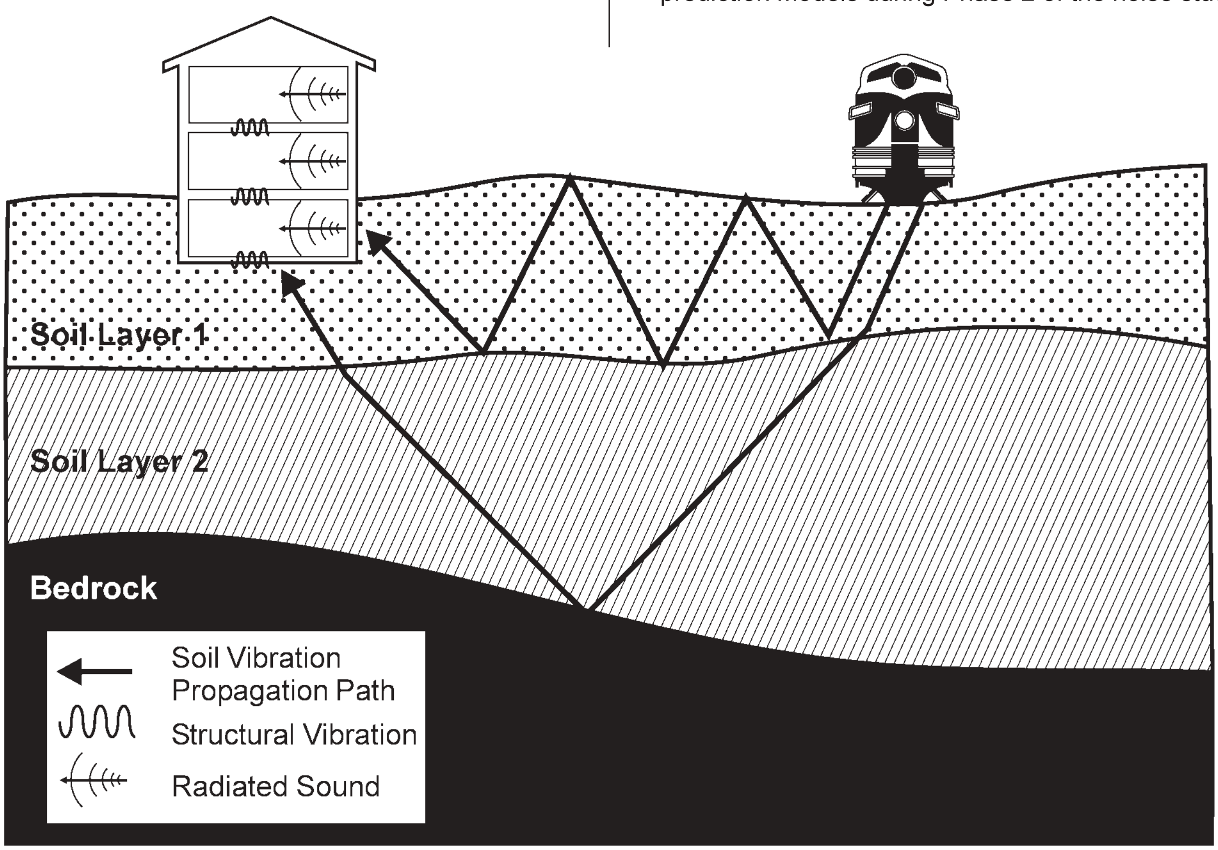


Figure 3. Ground-borne Vibrations from Trains

A major focus of the study is to understand the propagation of ground-borne vibrations in the various soil types found in the study area. Measurements were made at sites representative of each of the three soil types in the study area (V1 - clay; V2 - peat; and V3 - sand). In addition, noise and vibration measurements were made at two homes (H1 and H2) to identify the source of the vibrations (ground-borne vibration or air-borne noise) reported by the owners. Figure 3 provides a graphical representation of ground-borne vibrations.

Reference noise and vibration levels were measured on a total of 86 trains. The measurements were conducted over three one-week periods in March, May and June 2002. During this time, train operations varied considerably, allowing the characterization of all the train types operated by the ARR during a typical year. The resulting information identifies existing conditions, and serves both as a baseline for comparison with future conditions and as reference data for making predictions during Phase 2.

Key Findings - Noise

- The table below summarizes the ambient noise levels recorded at the long term monitoring sites. Noise levels decrease as the distance from the track increases. For reference, Figure 4 below shows noise levels for typical residential areas.
- The highest noise levels occur at the monitoring sites near grade crossings where whistles are blown (N3, N6, and N7).
- The noise levels show seasonal variation. Spring and summer noise levels are higher than winter noise levels. The increase may be attributable to a number of factors, including an increased number of trains, increased outdoor activity in general, increased aircraft noise, and lack of snow cover.
- Noise levels from ARR rolling stock and whistles are similar to or quieter than those used in FTA's noise prediction methodology. SD70 locomotives sounding whistles have the highest "sound exposure level" (a measure of cumulative noise emitted by the locomotive passby; 103 dBA), while loaded coal cars had the lowest (80 dBA).
- The data confirm the applicability of the FTA model for use during the next phase of the study to predict noise levels associated with the capacity improvement alternatives.

Summary of Existing Ambient Noise Measurements

Site No.	Measurement Location, Distance from Track	Noise Exposure Ldn (dBA)		
		March	May	June
N1	8th Avenue and Stolt Lane, 66 feet	59	66	65
N2	Fish Creek Embankment, 200 feet	56	58	59
N3	36th Avenue Crossing, 100 feet	66	76	71
N3A	Lois Avenue near 36th Avenue, 250 feet	N/A	N/A	61
N4	La Honda Mobile Home Park, 40 feet	61	68	67
N5	Residence near Elderberry Park, 60 feet	59	67	67
N6	Harding Drive, 70 feet	61	71	69
N7	Wastewater Utility Gate, 60 feet	66	63	71
N8	Forest Park Drive, 500 feet	N/A	N/A	57

N/A – No measurements obtained.
Ldn – Cumulative noise exposure over 24-hours, weighted to reflect higher human sensitivity to noise at night.
dBA – Decibels within frequencies detectable by the human ear.

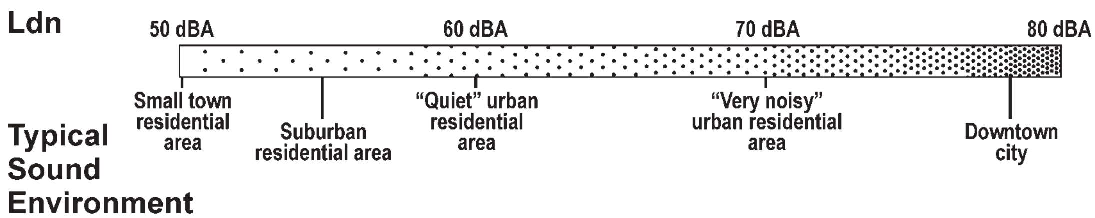


Figure 4. Typical Ldn's for Residential Areas

Key Findings - Vibration

- Ground-borne vibration propagation varies according to soil type when soils are unfrozen. As shown in Figure 5, clay and peat are more efficient in transmitting vibration, and sand is less efficient. Using the vibrations from the SD70 locomotive as an example, vibrations at Sites V1 (clay) and V2 (peat) propagate further and at a higher level than those from Site V3 (sand). Clay transmits the vibrations further, but not as far as the peat.
- As shown in Figure 6 below, there is a seasonal effect on vibration propagation as well. Vibration levels from trains are highest in summer and lowest in winter (with frozen ground). Summer vibrations are about 5 vibration decibels (VdB) higher than those measured in the spring, and about 10 VdB higher than those measured in winter.

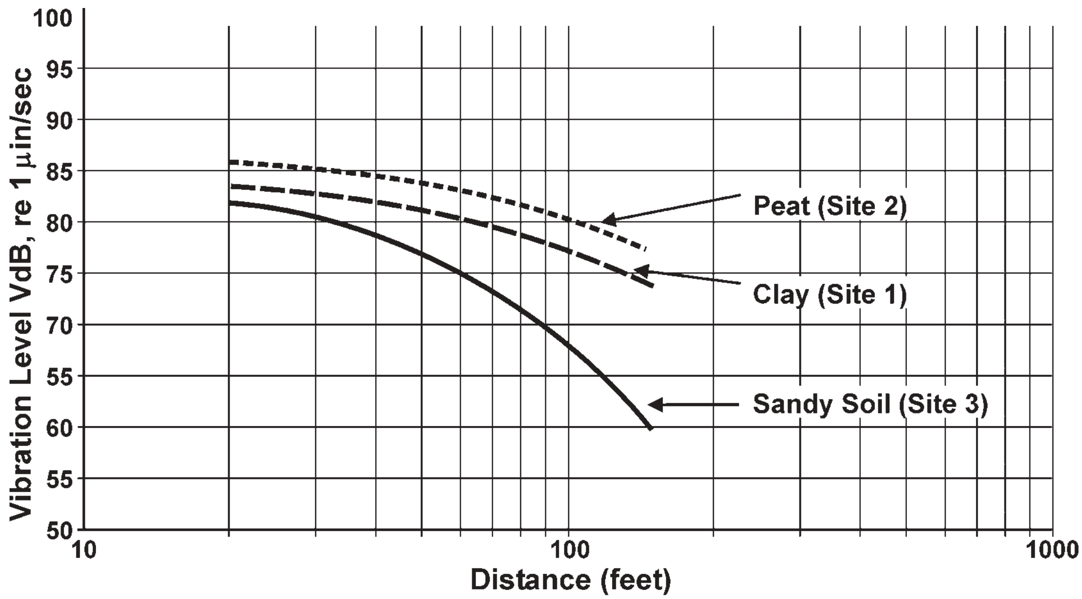


Figure 5. Propagation of Vibrations from SD70 Locomotive for Different Soil Types (Spring)

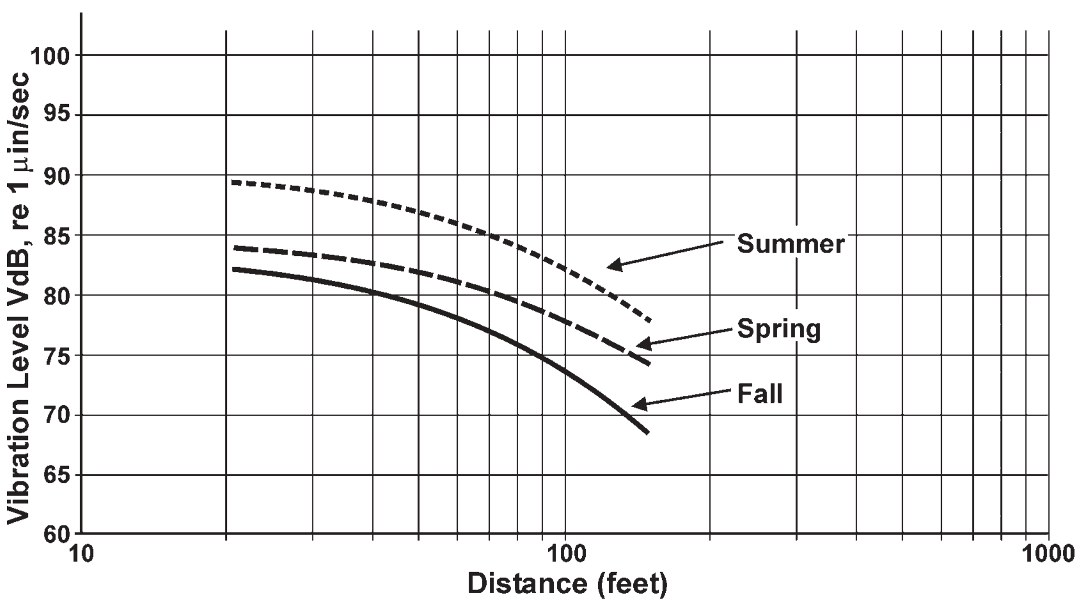


Figure 6. Seasonal Propagation of Vibrations from SD70 Locomotive at Nulbay Park (Site V1)

- Vibration levels from trains recorded 100 feet from the track are well below those that cause damage to buildings. However, some of the vibration levels recorded are above the FTA criteria for residential annoyance.
- During winter when the ground is frozen, vibration propagation is similar for the three different soil types, similar to summer propagation in sandy soils.
- Increasing train speed tends to increase vibration levels. However, vibration levels associated with passenger trains at all speeds (10 to 35 mph) were below the average level of the SD70 locomotive at 10 mph. Passenger trains can operate at 35 mph and still generate lower vibration levels than the SD70 locomotive at 10 mph.
- Vibration levels from ARR rolling stock are ranked as follows: SD70 locomotives generate the highest levels, followed by loaded gravel cars, GP40 locomotives, and passenger trains. The self-contained locomotive/ passenger car units (RDC) generate the lowest vibration levels.
- Homes within about 150 feet of the tracks in locations with sandy soil and 300 feet of the track in locations with clay and peat soil may have perceptible ground-borne vibrations generated by the SD70 locomotive. Beyond those distances, the ground-borne path is not likely to be the source of vibration.
- Air-borne noise at low frequencies travels greater distances than ground-borne vibrations, and may be the source of the vibration in walls causing rattling of wall-mounted objects that concerns some neighbors.

Figure 7 below summarizes these findings.

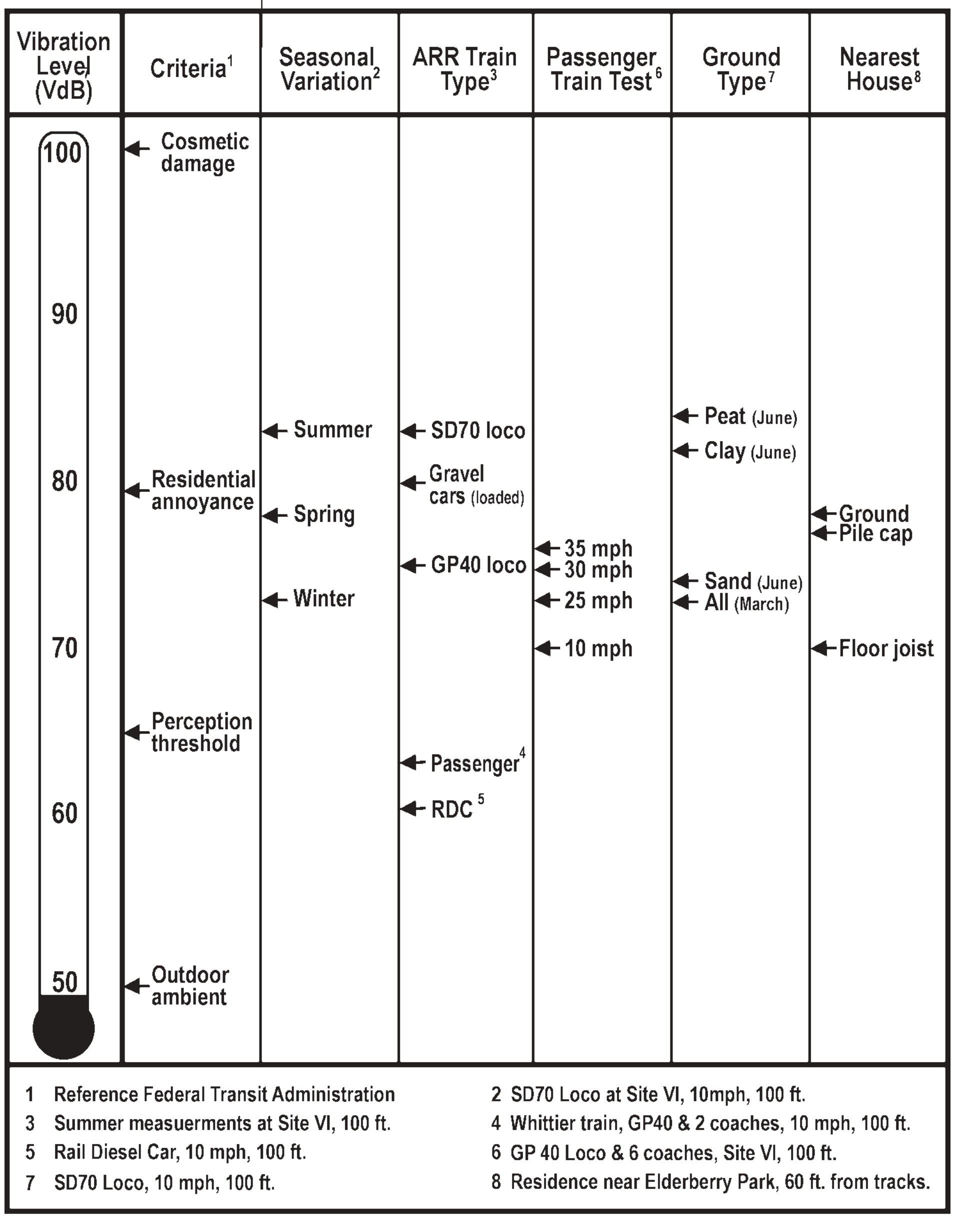


Figure 7. Summary of Vibration Measurements

What's Next

ARR will develop potential alternative track configurations and signal configurations for future train traffic in the corridor. In Phase 2, we will use this information, coupled with results obtained during the Phase 1 noise and vibration study, to predict noise and vibration effects of the various alternatives.

The results of the noise and vibration study will be included in the environmental document assessing the impacts of the various alternatives on physical, biological, and human resources. If the selected alternative involves construction with federal funds, mitigation of noise and vibrations impacts will be considered and incorporated into the project in accordance with federal standards.

ARR also will use the results of the noise and vibration study to guide operating practices and decisions. For example, Phase 1 study results will guide our practices in two ways. First, loaded gravel train speeds have an important effect on vibration, and existing speed restrictions (15 mph) need to be enforced. Second, the speed of passenger trains does not have such important effects on vibration. Therefore, we anticipate running passenger trains at faster speeds through this corridor in future years.

Special thanks

The Alaska Railroad sends special thanks to our neighbors who allowed us to place monitoring equipment on their property and made this noise and vibration study possible.

Public Involvement and Input:

The Alaska Railroad will present results from the noise and vibration study, as requested, at community council meetings. The complete Phase 1 noise and vibration study report is posted on our website at www.alaskarailroad.com and is available at the Alaska Railroad by calling ARRC Public Involvement Officer Stephenie Wheeler at 265-2671.

Public comments on Anchorage Capacity Improvements Project and the noise and vibration study may be submitted via the form below, or in a letter/memo mailed or emailed to the Railroad. Contact information is provided on the back page.

Alaska Railroad Corporation

Rail Capacity Improvements MP110-114 Noise & Vibration Study

Name

Phone

Address

Your Comments:

Alaska Railroad Program of Projects

The *Anchorage Rail Capacity Improvements MP110 to MP114* study is part of a comprehensive program of capital improvements. The railroad is investing millions on rail, ties and ballast to improve infrastructure. Safety and efficiency upgrades include projects to straighten the main track between Anchorage and Wasilla, build longer sidings (railroad "passing" lanes) and add automated and heated switches. The railroad is also capitalizing on opportunities to better serve Alaskans through new depots, passenger services and equipment. Project descriptions are at: www.AlaskaRailroad.com.

Public Input:

Public comment on any or all of these projects may be submitted via:

- Mail to: Capital Projects
  Alaska Railroad Corporation
  P.O. Box 107500
  Anchorage, AK 99501
- E-mail to *public_comment@akrr.com*
- Fax to (907) 265-2365
- ARRC's TTY/TTD 265-2620
  or voice 265-2494 or Alaska Relay TTY
  800-770-8973 or voice 1-800-770-82555

Summary of ARRC MP110-114 Noise-Vibration Study

Alaska Railroad analyzes noise and vibration dynamics along the corridor between the Anchorage Rail Yard (MP 114) and near the intersection of Tudor Road and Minnesota Drive (MP110), as part of a study on capacity improvement options.

DETAILS INSIDE ...

Alaska Railroad Corporation
P.O. Box 107500
Anchorage, Alaska 99501
www.AlaskaRailroad.com

DO YOU WANT TO RECEIVE FUTURE UPDATES ON THIS RAIL CAPACITY PROJECT?

☐ **Yes.** Keep me on your list.

☐ **No.** Take me off your list.

Fax back to 265-2365
Email wheelers@akrr.com
or call Ms. Wheeler at 265-2671