T-ROC Central Conveyor and Pier Project

Noise Analysis

Thorndyke, WA
Jefferson County

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MFG Project 9707

MFG, INC.
Atmospheric Sciences Group
19203 36th Avenue W, Suite 101
Lynnwood, WA 98036-5707

(425) 921-4000 FAX (425) 921-4040

consulting scientists and engineers

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INTRODUCTION

The proposed T-ROC Central Conveyor and Pier Project (the "T-ROC project") is one component of the Thorndyke Resource Operations Complex (T-ROC). The T-ROC project consists of five components: the existing Shine Pit, the existing Ace Paving Asphalt Plant, the proposed Wahl Expansion Area, the proposed Meridian Expansion Area, and the Central Conveyor with Pier. This analysis will focus on the Central Conveyor and Pier Project. The other four components of the T-ROC project have gone through separate environmental review processes or would need to conduct this review in separate processes.

The conveyor system part of the T-ROC project is approximately four miles long and is constructed to transport sand and gravel from the Shine Pit to a Pier on Hood Canal. The Pier is located approximately three miles south of the Hood Canal Bridge. At the Pier, sand and gravel will be transferred to barges and bulk carriers for delivery to customers for both construction and environmental mitigation projects (specifically beach restoration). The proposed site is located south of Highway 104 in the eastern portion of Jefferson County, Washington, between Port Ludlow and Dabob Bay. This site is approximately two miles southwest of the community of Shine and 1.25 miles west of the community of South Point.

The purpose of this analysis is to evaluate current noise levels at sensitive areas in the vicinity of the proposed conveyor and loading pier, and through the use of a computer model, estimate potential future noise impacts with the proposed project. Existing and future noise levels are compared to relevant criteria to determine land use compatibility, and general recommendations are made as necessary to reduce noise levels.

AFFECTED ENVIRONMENT

Introduction to Noise Descriptors

The human ear responds to a very wide range of sound intensities. The decibel scale used to describe sound is a logarithmic rating system that accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dBA. Therefore, a 70-dBA sound level will sound twice as loud as a 60-dBA sound level.

People generally can not detect sound level differences (increases or decreases) of 1 dBA in a given noise source. Although differences of 2 or 3 dBA can be detected under ideal laboratory situations, they are difficult to discern in an active outdoor noise environment. A five decibel change in a given noise source would be expected to be perceived under normal listening conditions.

Because the dB scale used to describe noise is logarithmic, a *doubling* of a *noise source* (i.e., twice as many pieces of the same equipment) produces a 3 dBA increase in average source noise. Average sound levels due to line sources such as a material conveyor decrease with distance from the conveyor at a rate of approximately 3 dBA per doubling of the distance. Peak sound levels from discrete events or point sources, such as from a material processing plant, decrease at 6 dBA per doubling of the distance from the plant. Conversely, moving half the distance closer to a source increases sound levels by 3 dBA and 6 dBA for line and point sources, respectively.

When addressing the effects of noise on people, it is necessary to consider the frequency response of the human ear. Sound measuring instruments are, therefore, often designed to respond to or ignore certain frequencies. The frequency-weighting most often used to evaluate environmental noise is A-weighting, and measurements from instruments using this system are reported in "A-weighted decibels" or dBA. All sound levels discussed in this evaluation are reported in A-weighted decibels.

For a given noise source, factors affecting the sound transmission from the source, which affect the potential noise impact, include distance from a source, frequency of the sound, absorbency of the ground surface, the presence or absence of obstructions and their absorbency or reflectivity, and the duration of the sound. The degree of impact on humans also depends on who is listening and on existing sound levels. Typical sound levels of some familiar noise sources and activities are presented in **Table 1**.

Table 1. Sound Levels Produced by Common Noise Sources

Thresholds/ Noise Sources	Sound Level (dBA)	Subjective Evaluations	Possible Effects on Humans[a]
Human Threshold of Pain Carrier jet takeoff at 15 meters (50 ft)	140	Deafening	Continuous exposure to levels above 70 can cause hearing loss in majority of population
Siren at 30 meters (100 ft) Loud rock band	130		
Jet takeoff at 61 meters (200 ft) Auto horn at 0.9 meters (3 ft)	120		
Chain saw Noisy snowmobile	110		
Lawn mower at 0.9 meters (3 ft) Noisy motorcycle at 15 meters (50 ft)	100	Very Loud	
Heavy truck at 15 meters (50 ft)	90		
Pneumatic drill at 15 meters (50 ft) Busy urban street, daytime	80	Loud	
Normal automobile at 80 kph (50 mph) Vacuum cleaner at 0.9 meters (3 ft)	70		Speech Interference
Air conditioning unit at 6 meters (20 ft) Conversation at 0.9 meters (3 ft)	60	Moderate	
Quiet residential area Light auto traffic at 30 meters (100 ft)	50		Sleep Interference
Library Quiet home	40	Faint	
Soft whisper at 5 meters (15 ft)	30		
Slight rustling of leaves	20	Very Faint	
Broadcasting Studio	10		
Threshold of Human Hearing	0		

Note that both the subjective evaluations and the physiological responses are continuums without true threshold boundaries. Consequently, there are overlaps among categories of response that depend on the sensitivity of the noise receivers.

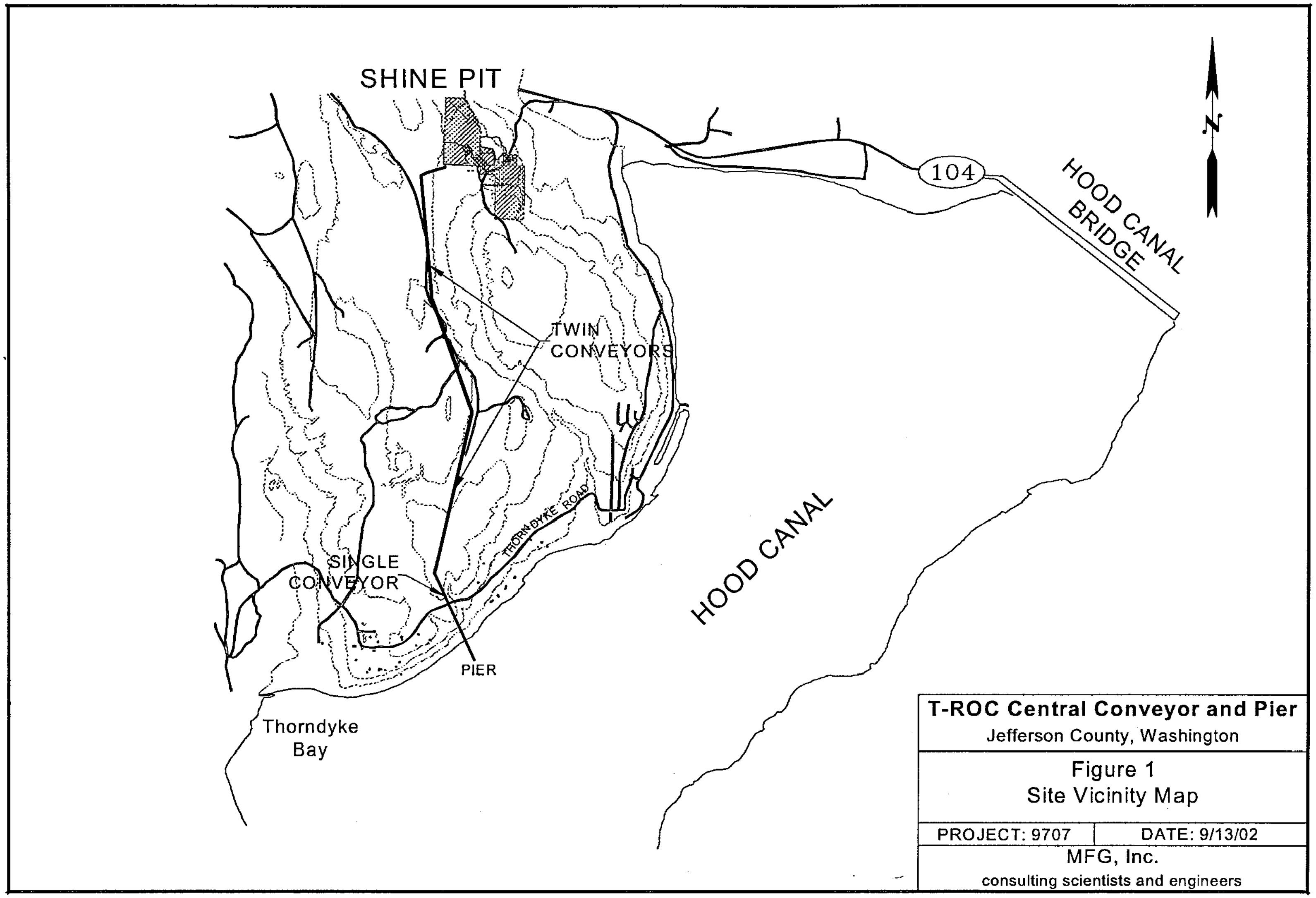

Figure 1. Site Vicinity Map

While the United States Environmental Protection Agency (EPA) has no regulations governing environmental noise, the EPA has conducted extensive studies to identify the effects of certain sound levels on public health and welfare. The U.S. EPA "Levels Document" identifies sound levels "requisite to protect the public health and welfare with an adequate margin of safety" (U.S. EPA 1974). EPA specifies an L_{dn} of 55 dBA for outdoor areas where quiet is a basis for use. Partly because neither the cost nor feasibility of achieving these noise levels was taken into consideration, these levels are guidelines, not regulations or standards.

Zoning and Land Use

Jefferson County is the local authority responsible for planning and zoning in the project corridor and its vicinity. The majority of the land on which the T-ROC project will be constructed is part of an area known as the *Thorndyke Resource Management Area* or *Thorndyke Block*, which is approximately 15,000 acres of long-term forest production owned by Pope Resources and managed by Olympic Resource Management. Jefferson County's land use designation for this area is Commercial Forest (CF-80).

The southern end of the Central Conveyor and Pier would be located outside the Thorndyke Block on 18.3 acres owned by Hood Canal Sand and Gravel. These 18.3 acres are adjacent to the Thorndyke Block and Hood Canal. Jefferson County's land use designation for this area is Rural Residential, 1 dwelling unit per 5 acres (RR 1:5).

The majority of the project site is located far from residential uses or other sensitive noise receivers. The receivers with the most potential to be impacted by the T-ROC Central Conveyor and Pier consist of sparsely located residential properties near Transfer Point #5, the Single Conveyor, and the Pier. This analysis will focus on these potentially-affected residential receivers. The project would be considered a Class C noise source and the nearest residential uses would be considered Class A receivers. Therefore, noise generated by the corridor and loading facilities would be limited by Jefferson County noise standards to 60 dBA during the day and 50 dBA at night, plus the short-term noise increases. The proposal indicates that the conveyor could operate anytime, day or night, and would therefore be effectively limited to the more restrictive 50 dBA limit. With the short-term increases, the operation would be considered in compliance if its L_{25}, $L_{8.3}$, and $L_{2.5}$, as measured on a nearby residential property, did not exceed 50, 55, and 60 dBA, respectively, and if the highest measured sound level (L_{max}) did not exceed 65 dBA.

Figure 1 shows the general location of the project.

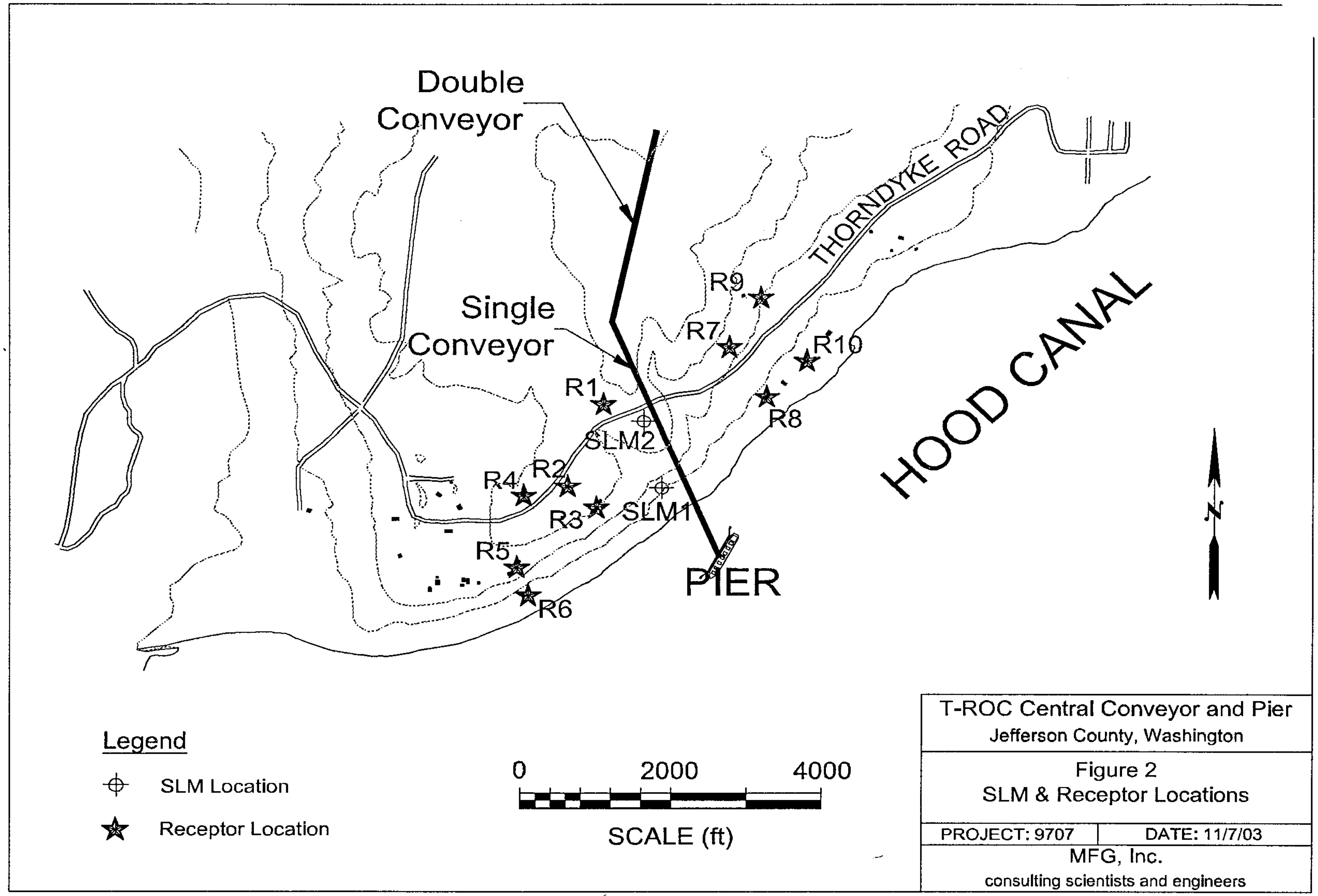

Figure 2. SLM and Receptor Locations

ENVIRONMENTAL NOISE IMPACTS

Noise impacts related to the proposed T-ROC Central Conveyor and Pier Project would be due to construction activities, future operation of the conveyor, and vessel loading activities.

Construction Noise

Noise from construction activities would occur due to the installation of piles; some grading, excavation and/or fill activity; and installation of the conveyor sections, transfer points, and pier facilities. These activities would require the use of a pile driver to install the piles; graders, dozers, and scrapers for earth moving activities; and a truck and crane for placement of the conveyor sections. Typical construction noise levels for these activities and equipment are displayed in **Table 4**.

The nearest residences to the conveyor corridor would be further than 600 feet from the conveyor line and requisite clearing, grading and erection activities and greater than 1,200 feet from the pier and requisite pile driving activities. These distances between construction activities and the receivers would serve to attenuate much of the construction noise. Construction activity is exempt from Washington State's noise regulations during daytime hours (7 a.m. to 10 p.m.) but would be audible at times on nearby properties.

Table 4. Typical Construction Equipment Noise (dBA)

Activity	Estimated Leqs		
	At 100 ft	**At 600 ft**	**At 1,200 ft**
Clearing	77	61	55
Grading	69-82	53-66	47-60
Erection	66-78	50-62	44-56
Pile Driving (Impact)	86-100	70-84	64-78
Pile Driving (Vibratory), Medium frequency	60	44	38
Equipment	**Range of Sound Levels**		
	At 100 ft	**At 600 ft**	**At 1,200 ft**
Bulldozer	71-90	55-74	49-68
Dump Truck	76-88	60-72	54-66
Scraper	74-87	58-71	52-65
Crane	69-79	53-63	47-57
Generators	65-76	49-60	43-54
Compressors	68-75	52-59	46-53
Source: EPA, 1971.			

Operational Noise

The proposed action would involve the use of a conveyor to transport sand and gravel material from the Fred Hill Materials sand and gravel pit in Shine to a vessel loading facility on the Hood Canal near Thorndyke.

Noise sources associated with operation of the T-ROC Central Conveyor and Pier include:

- Transfer points on the conveyor
- The conveyor
- The vessel loading facility

MFG measured the sound levels of a conveyor and transfer point for a previous noise analysis. The transfer point was not enclosed and resulted in a measured sound level of 56 dBA at 100 feet. Because the transfer points proposed for this project would be enclosed, the sound level of the transfer point is likely somewhat overstated in this analysis.

The measured sound level of the conveyor section was 49 dBA at 100 feet and was influenced by other equipment operating nearby in the active sand and gravel pits. Also, the conveyor used for the source noise measurement was not fully enclosed. An enclosure would be expected to reduce the noise from the conveyor, and the conveyor is proposed to be fully enclosed between the bluff and the vessel loading gantry. For these reasons, the measured sound level of the conveyor used for the noise predictions is anticipated to be somewhat higher than the actual level of the conveyor.

Because noise from ship-loading activity is expected to be similar to noise from barge-loading activity, the measured sound levels of barge-loading activity described in the Maury Island Gravel Mine EIS (July, 2000) are used for this analysis. The sound level of the vessel loading does not include the warning alarm sounded at the onset of loading or the squeaks of the conveyor. Both of these sounds could be louder than the ship loading but can be effectively mitigated through the use of strobe lights for the alarm and adequate maintenance for the squeaky equipment.

The measured noise levels and frequency content of the equipment were used in the prediction of future noise levels resulting from the conveyor and loading pier. **Table 5** summarizes the sound levels used in the noise evaluation. Because the noise generated by the conveyor and pier would be fairly constant over an hour with few louder short-term events, the most restrictive limit would be the L_{25}. Therefore, in order to more closely relate the modeled sound levels with the applicable noise limits, the measured L_{25} of each source was used when this information was available.

Table 5. Summary of Source Noise Levels

Source	Sound Level at 100 Feet (dBA)
Conveyor	49
Conveyor Transfer Point	56
Vessel Loading	64

Environmental Noise Model (ENM)

Noise generated by the anticipated noise sources was evaluated using the Environmental Noise Model (ENM). ENM is a computer program which allows entry of detailed information on the acoustical characteristics of noise sources, intervening topography (including barriers and structures) and meteorological conditions. ENM computes noise levels at selected receiver locations based on the above inputs and noise calculation techniques.

After the noise sources were characterized by measurements of representative equipment, 3-dimensional maps of the site and vicinity were created to enable the ENM model to evaluate effects of distance and topography on noise attenuation. Sound power levels based on the measurements of equipment were assigned to the appropriate locations in the project corridor. ENM was then used to construct topographic cross sections and to evaluate noise impacts in the vicinity of the project site.

Because sound energy spreads as it radiates from a source, its apparent loudness also decreases. For a single point source (i.e., a transfer point), the sound level decreases at a rate of 6 dBA per doubling of the distance. For a line source (i.e., the material conveyor), the sound level decreases at a rate of 3 dBA per doubling of the distance. Sound loss due to divergence of sound energy is the same for all frequencies, and is independent of any weighting scale used. In the absence of hills or berms, distance is the primary mechanism for decreasing the noise from the site at distant receptors.

Some of the energy in a sound wave is absorbed by the atmosphere. The amount of absorption depends on the frequency of the sound and the temperature and relative humidity of the atmosphere. This absorption is normally ignored for short distances, but the effect becomes significant as the distance between the source and receiver increases. Because of the more effective absorption of higher frequencies, atmospheric absorption would also tend to lower the pitch of noise generated at the site. Thus the "droning" sound of heavy equipment is more audible at a distance than higher-pitched squeaks.

The surfaces over which sound waves travel affect the amount of sound at a distant receptor in a complex manner. In short, hard surfaces such as asphalt or water can reflect energy and increase the sound level at distant receptors. A soft surface would be expected to absorb sound energy and it could produce a reflected wave that interferes with the direct sound wave and reduces the sound level expected due to distance. These interactions are commonly referred to as "ground effects." In addition to surface qualities, the magnitude of the ground effect depends on the height of the source and receiver and the frequency of the sound.

If a wall or hillside obstructs the line-of-sight between a noise source and receiver, the sound waves must bend (or refract) around the obstruction in order to reach the receiver. At some sensitive receivers, intervening terrain would serve as noise barriers that would substantially reduce impacts from the proposed noise sources.

Trees are generally considered to be poor sound barriers. At frequencies below 1000 Hz, the attenuation due to trees is due more to the loosening of the soil by their roots (enhancing the ground effect) than to any effectiveness as a barrier. To obtain appreciable attenuation, a very dense vegetation and significant distances are required. Except to the extent that vegetation influences ground effects, noise attenuation by vegetation was ignored in this study.

Sound propagation through the atmosphere is affected by wind and temperature change with height. With a temperature inversion, temperatures at the surface are colder than the temperatures aloft and the atmosphere is said to be stable. This causes sound waves radiating upward to bend back toward the ground, which reduces distance attenuation. Sound traveling downwind also bends downward. Sound refracts upward when the sound is traveling upwind, or when the atmosphere is unstable. An unstable atmosphere is common on sunny days, when the ground and lower air masses are warmer than the air aloft. The bending of sound waves upward produces a "shadow zone" near the ground, where sound levels are reduced by as much as 20 dB.

The ENM model allows the user to calculate sound levels for any reasonable meteorological condition. In the evaluation of the individual receiving locations, MFG evaluated three meteorological conditions. The first condition would result in the least increase in sound levels at distant receivers (i.e., favorable from a noise standpoint) and consisted of calm conditions and a neutral atmosphere (-1 °C/100 meters). The second condition would result in somewhat elevated sound levels at distant receivers and consisted of calm conditions and a stable atmosphere (+3 °C/100 meters). The third condition consisted of light winds (3 meter/second, approximately 7 miles/hour) and a neutral atmosphere; this condition would increase equipment sound levels at distant receivers located downwind of the noise-producing equipment while simultaneously reducing sound levels at receivers located upwind from the noise sources.

Modeling Results

Both hourly and daily sound levels were predicted and compared to the existing measured sound levels. Each are presented seperately.

Hourly Sound Level Results

Based on the source noise level data and the vicinity topography, noise levels were predicted at nearby residential receivers. The individual receivers are displayed in **Figure 2**. Potential noise impacts were determined by comparing the predicted hourly sound levels with the Washington State noise limits. The modeled sound levels are in terms of the L_{25} to allow for better comparison with the state noise limits. MFG evaluated a scenario assuming the conveyor and vessel loading activities would occur continuously over an hour.

The modeled sound levels for each receptor location are presented in **Table 6**.

Table 6. Predicted Hourly Sound Levels (L25, dBA)

Location	Meteorological Condition						
	Calm, Neutral Atmosphere				Calm, Stable Atmosphere	Wind[1]	Limit Day/Night
	Predicted	Existing	Cumulative	Increase			
R1	34	25-44	34-44	0-9	36	30(SW) - 40(NE)	60/50
R2	29	25-44	31-44	0-6	33	23(SW) - 41(NE)	60/50
R3	36	30-46	37-46	0-7	39	33(SW) - 42(NE)	60/50
R4	25	25-44	28-44	0-3	30	19(SW) - 39(NE)	60/50
R5	30	30-46	33-46	0-3	33	24(SW) - 44(NE)	60/50
R6	34	30-46	36-46	0-6	37	29(SW) - 44(NE)	60/50
R7	33	25-44	34-44	0-9	36	28(N) - 45(S)	60/50
R8	36	30-46	37-46	0-7	39	30(N) - 47(S)	60/50
R9	22	30-46	31-46	0-1	28	14(N) - 41(S)	60/50
R10	30	25-44	31-44	0-6	36	23(NE) - 44(S)	60/50

[1] Sound levels under windy conditions were modeled with wind directions from the south (S), southwest (SW), north (N), and northeast (NE). The sound levels shown represent the range of levels predicted with the four stated wind directions.

Under all meteorological conditions analyzed, predicted sound levels at all receptor locations easily meet the nighttime noise limit of 50 dBA applicable between 10 p.m. and 7 a.m. and fall far below the allowable daytime noise level of 60 dBA (**Table 6**).

The predicted sound levels under neutral/calm conditions were also compared to the existing measured levels as a means to gauge potential impacts. Only the neutral/calm predictions were used in the comparison because these best represent the conditions during the sound level measurements. The predicted increases of up to 9 dBA over the existing levels indicate that the vessel loading facility (i.e., the dominant noise source from the proposed project) could be quite audible at the nearest residences and could cause potential noise impacts during quieter hours of the day, generally between the later evening (~8 p.m.) and early morning (~6 a.m.) hours.

Although sound level increases as high as 9 dBA could be intrusive at exterior locations, residents are typically inside their homes during the quietest nighttime hours when the highest increases were predicted, and interior sound levels of the loading activities would be quieter than the predicted exterior sound levels shown in **Table 6**. The loading activity sound levels inside the residences would typically be reduced by 10-15 dBA with open windows and 20-25 dBA with closed windows when compared to the exterior levels. Because interior sound levels in a quiet bedroom typically range from the upper 20s to mid 30s dBA due to noise sources like furnaces, fans, refrigerators, etc., and loading activity noise would generally be in the teens and 20s dBA inside the homes, it is not anticipated that noise from loading activities would be intrusive inside residences.

Daily Sound Level Results

In addition to predicting *hourly* sound levels to facilitate comparison with the applicable State/County noise limits, MFG predicted the day-night sound levels (L_{dn}) to facilitate comparison with EPA guidelines. As defined previously in this report, the L_{dn} is a 24-hour averaged sound level (L_{eq}) with a 10-decibel penalty added to sound levels that occur between 10 p.m. and 7 a.m. in consideration of potential disturbance of people trying to sleep. EPA identifies an L_{dn} of 55 dBA as protective of the health and welfare of the public.

To calculate the L_{dn}s from loading activity, MFG assumed that loading could occur 24-hours a day. This is more than the 20 hours per day expected with the largest bulk carrier vessels, but ensures that the most conservative scenario is considered. It is anticipated that loading activities would actually occur fewer than 20 hours per day, resulting in lower predicted L_{dn}s than shown in **Table 7**.

Table 7. Predicted Day-Night Sound Levels (L_{dn}, dBA)

Receptor	Project Level	Measured Existing	Cumulative (Existing+Project)	Increase over Existing[a]
R1	40	45	47	1
R2	36	45	46	0
R3	42	43	46	3
R4	32	45	46	0
R5	36	43	44	1
R6	41	43	45	2
R7	40	45	46	1
R8	42	43	46	3
R9	28	43	43	0
R10	36	45	46	0

[a] Apparent discrepancies in the calculated increases are due to rounding of the levels to whole numbers.

As can be seen in **Table 7**, even assuming that loading could occur 24-hours a day, the predicted project-related L_{dn}s as well as the predicted cumulative L_{dn}s are far below the 55 dBA that EPA considers protective of health and welfare.

The predicted L_{dn}s under neutral/calm conditions were also compared to the existing measured L_{dn}s as a means to gauge potential impacts. Only the neutral/calm predictions were used in this comparison because these best represent the conditions during the sound level measurements and because adverse conditions (i.e., temperature inversions, wind blowing consistently in the same direction) do not typically occur continuously over a 24-hour period. The predicted increases in the L_{dn}s ranged from 0 to 3 dBA, which indicates that the long-term activities would likely have a moderate impact on the sound levels in the existing community even though the short-term hourly sound level increases discussed previously in this report could be considered intrusive.

Shoreline Noise Limits

In addition to adopting the WAC noise standards, Section 18.25.100 of the Jefferson County Code establishes performance standards for noise sources located in aquatic shoreline designations. JCC 18.25.100 (3) (f) specifies that the maximum level for noise generated in the aquatic shoreline designation shall be 50 dBA at a distance of 100 feet. This standard shall not apply to vessels that are underway.

The only equipment proposed to operate in the shoreline area is the fully enclosed material conveyor. The conveyor sound level used in this analysis, i.e., 49 dBA at 100 feet, is likely conservatively high because the conveyor used to represent this was not fully enclosed. Regardless, the sound level of the conveyor meets the requirement of a sound level of 50 dBA at 100 feet for noise sources in the shoreline area.

MITIGATION

Construction

Construction activities would be restricted to daytime hours to reduce the potential for noise impacts.

Operation

The project proposal includes several noise mitigation measures that would be expected to reduce noise levels from much of the project equipment. The mitigation measures include fully enclosing the conveyor between the bluff and the loading gantry at the end of the pier, fully enclosing the portion of the conveyor traveling over Thorndyke Road, covering those portions of the conveyor not fully enclosed, and enclosing the conveyor transfer points. These inherent noise-reducing features were not included in the noise modeling, and the actual sound levels of the conveyor and vessel-loading activity are likely to be somewhat lower than the predicted levels.

In addition to the above equipment noise reduction measures included as part of the project, the following additional mitigation measures would help alleviate other potential noise impacts from the proposed project:

- Restrict the use of a loud alarm sounded prior to startup of the conveyor during nighttime operations of the facility. Although warning devices and alarms are exempt from the state noise limits, their purpose requires that they be loud enough to be heard over the background sound level and may be disturbing to nearby residents, particularly at night. Alternative warning devices such as a strobe light would likely require the approval of a state agency.

- Provide regular maintenance to ensure that the equipment emits minimal noise due to unbalanced or poorly maintained components (e.g., squeaky conveyor rollers).

UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

Predicted increases in nighttime noise under calm, neutral conditions could be as high as 9 dBA over the lowest existing sound levels during the quietest hours of the day. Increases of this magnitude would be quite noticeable to nearby residents and could be considered disturbing. However, the overall predicted levels of the conveyor and vessel loading activity are quite low, generally in the 20s to high 30s dBA, which would greatly reduce the potential for significant impacts from the proposed project. Also, the predicted cumulative day-night sound levels (L_{dn}s) with the project were all below the 55 dBA EPA considers protective of the public health and welfare.

REFERENCES

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Attachment A:

Sound Level Measurement Results

SLM1: Near Hood Canal								
Date	Time	Leq	Lmax	Lmin	L2	L8	L25	L90
13-Feb	11:00:00	41.4	54	37	44.5	43.7	42.5	39
13-Feb	12:00:00	41	55.6	36.9	45.5	42.6	41.3	38.5
13-Feb	13:00:00	42.5	60.4	39.2	45.8	43.6	42.7	41.1
13-Feb	14:00:00	47.7	68.2	40.8	56	50.7	45.7	42.6
13-Feb	15:00:00	47.4	65.9	38.9	55.9	49.4	45.7	41.8
13-Feb	16:00:00	40.5	60.6	36	44.3	41.6	40.5	38.1
13-Feb	17:00:00	39.8	55.2	34.7	44.2	41.6	40.1	37.4
13-Feb	18:00:00	37.6	56.4	32.5	41.9	39.2	37.9	35
13-Feb	19:00:00	35.3	52.1	28.8	42	37.4	35.6	29.8
13-Feb	20:00:00	31	41.9	28.7	34.9	33	31.3	29.3
13-Feb	21:00:00	31.6	53.4	28.9	34.2	31.8	30.9	29.6
13-Feb	22:00:00	31.1	45.6	29	34.9	31.8	30.9	29.6
13-Feb	23:00:00	32.5	53.2	29.1	40.1	31.9	30.9	29.9
14-Feb	0:00:00	30.1	47.8	28.8	31.5	30.9	30.5	29.2
14-Feb	1:00:00	30.5	50.3	28.8	33.2	31.2	30.7	29.3
14-Feb	2:00:00	29.8	36.5	28.5	31.7	31	30	29.1
14-Feb	3:00:00	40	63.8	28.3	45.7	31.5	30.2	29.1
14-Feb	4:00:00	33.3	44.3	29.1	38.6	35.8	33.8	30.4
14-Feb	5:00:00	33.7	47.1	29.2	39.1	36.1	34.2	30.3
14-Feb	6:00:00	37.7	59.4	28.7	47	41.5	34.7	29.6
14-Feb	7:00:00	37.6	60	29.9	45.4	40	34.6	30.8
14-Feb	8:00:00	40.8	69.5	28.6	50.1	41.5	34.8	29.4
14-Feb	9:00:00	35.4	56.1	28.3	44.5	38.6	34.3	29.6
14-Feb	10:00:00	38.9	55.3	30.8	46.6	43.4	38.5	32.7
14-Feb	11:00:00	39.8	69.2	31.5	44.2	41.9	40.2	33.4
14-Feb	12:00:00	42.2	55.9	37.6	47	45	42.3	39.5
Ldn 43.1								

SLM2: Near Thorndyke Road								
Date	Time	Leq	Lmax	Lmin	L2	L8	L25	L90
13-Feb	12:00:00	42.9	72.7	23.8	51.2	45.9	38.1	26.3
13-Feb	13:00:00	40.9	67.3	26.3	50.6	44.3	37.3	29.5
13-Feb	14:00:00	45	74.8	29.5	53.5	49.3	43.5	32.2
13-Feb	15:00:00	44.1	64.5	27	53.4	49	41.5	30.9
13-Feb	16:00:00	40.7	62.3	23.8	51.1	44.1	34.9	25.6
13-Feb	17:00:00	41.3	63.2	23.2	50.8	45.6	37.7	25.8
13-Feb	18:00:00	39.3	59.4	21.8	50.4	41.6	31.3	23.1
13-Feb	19:00:00	35.6	55.1	21.3	46.6	37.5	26.6	22.3
13-Feb	20:00:00	36.4	55.1	22.1	48.7	35.6	28.8	23.3
13-Feb	21:00:00	35.8	58.7	23.1	46.8	33.4	27.3	24.4
13-Feb	22:00:00	34.1	57.9	22.5	40.8	30.9	26.6	24.1
13-Feb	23:00:00	31.7	52.7	22.6	42.1	29.8	25.7	23.4
14-Feb	0:00:00	27.8	54.2	22.2	27.9	26	25	23.2
14-Feb	1:00:00	26.9	48.3	21.9	34.3	28.3	25.8	23.3
14-Feb	2:00:00	27.1	46.2	21.3	34.7	30.3	26.4	22.2
14-Feb	3:00:00	41.1	65.7	20.9	47.7	31.4	25	21.7
14-Feb	4:00:00	35.2	54.9	22.5	43.9	35.4	29.9	24.4
14-Feb	5:00:00	39	61.1	22.6	50.1	39.1	30.8	24.6
14-Feb	6:00:00	43.2	69.8	23.6	52.4	45.2	38.7	26.1
14-Feb	7:00:00	41.5	64.4	25.4	51.9	44.7	37	28.2
14-Feb	8:00:00	43.4	63	24.4	53.8	47.7	37.1	27
14-Feb	9:00:00	40.9	59.3	24.8	51.8	45.5	35.4	27
14-Feb	10:00:00	41.2	65.2	23.3	50.8	44.9	37.1	25.7
14-Feb	11:00:00	42.2	66.7	24.1	51.8	46.5	39.5	27.5
14-Feb	12:00:00	40.9	66.3	23.9	50.2	45.4	38.2	26.5
14-Feb	13:00:00	42.6	64.5	23.6	52.7	47.5	39.6	26.8
Ldn	45.4							