

## 4.11 NOISE

### 4.11.1 Introduction

This section describes the environmental consequences associated with implementation of the Proposed Action and alternatives. Analysis methods and effect conclusions are discussed.

### 4.11.2 Assessment Methods

Construction activities are considered to be temporary, short-term activities because they would cease after facility construction is complete. Dredging also is considered to be a recurrent, short-term activity because it would not occur permanently in any given location. Processing facility operations are considered to be long-term, permanent operations because they occur at a fixed location for an extended period of time.

The noise standards in Table 3.13-2 were used to determine whether Project-related activities would result in adverse noise levels. The following thresholds are used, specific to this Project.

Dredging and construction operations:

- 75 dBA- $L_{eq}$  daytime (7:00 a.m. to 10:00 p.m.)
- 65 dBA- $L_{eq}$  nighttime (10:00 p.m. to 7:00 a.m.)

Processing facility operations:

- 65  $L_{dn}$

The following discussion describes how various components of the Project are evaluated.

#### 4.11.2.1 Construction

Activities under the Proposed Action and alternatives may call for construction of new facilities or expansion of existing facilities. The USEPA has developed generalized noise levels for various phases of construction associated with domestic housing, nonresidential construction, industrial construction, and public works construction (USEPA 1971). Noise levels for industrial construction are used for this assessment. Table 4.11-1 summarizes noise levels for each phase of typical industrial construction. It

also shows the distance within which the daytime and nighttime thresholds identified above would be exceeded.

**Table 4.11-1 Construction Noise Levels for Industrial Facility Construction**

Construction Phase	Noise Level at 50 Feet	Distance (feet) within Which the Indicated Noise Level Is Exceeded	
		75 dBA <sup>a</sup>	65 dBA <sup>b</sup>
Ground clearing	87	200	630
Excavation	90	280	890
Foundations	89	250	790
Building/facility construction	85	160	500
Finishing and cleanup	89	250	790

Note: dBA = A-weighted decibel(s)

<sup>a</sup> Daytime threshold.

<sup>b</sup> Nighttime threshold.

Source: USEPA 1971.

#### 4.11.2.2 Dredging

Each Dredger has provided information on dredging operations, including the number and size of engines used on each dredge and tugboat. Noise from dredging and tugboat operations has been estimated from these data using methods recommended by Hoover & Keith (2000). Tables 3.13-5 and 3.13-6 in Section 3.13 summarize the noise levels generated by each dredge or tug boat. Under the Proposed Action and alternatives, noise generated by dredges and tug boats was assumed to be unchanged. The duration and location of dredging, however, would change.

#### 4.11.2.3 Processing Operations

Existing sand plants within the Project area use front-end loaders, cranes, conveyors, and other processing equipment. Based on information provided by the MDNR (Zeaman pers. comm.), it was assumed that each plant has, at minimum, a crane, four loaders, and one dozer. Noise generated by this equipment has been estimated using noise source levels developed by the FHWA (2006). Simultaneous operation of this equipment would result in source noise level of approximately 83 dBA-L<sub>eq</sub> at 50 feet. Noise from other equipment at these facilities has been estimated using data from a plant with screens, crushers, conveyor belts, cyclones, sand classifiers, and screws (Bauer and Spencer 2008). This facility produces a reference sound level of approximately 89 dBA at 50 feet. The

combined sound level of all of the equipment is 90 dBA- $L_{eq}$  at 50 feet. Assuming continuous operation between 7:00 a.m. and 7:00 p.m., this level of noise corresponds to 87  $L_{dn}$  at 50 feet.

For the purposes of this assessment, it was assumed that all facilities with annual production of 250,000 tons or less would produce a sound level of 87  $L_{dn}$  at 50 feet. For larger facilities, the source noise level was scaled up based on the amount of production in excess of 250,000 tons/yr. As discussed in Section 3.14.2, a doubling of sound energy corresponds to a 3-dB increase in noise. Therefore, a doubling of delivered product volume was assumed to result in a 3-dB increase in facility noise. The change in noise level associated with larger or smaller changes in product volume also can be calculated directly. For example, a 10-percent increase in product volume would result in a 0.4-dB increase in noise.

Trucks that deliver product also are a source of noise on local roadways. Haul truck noise was calculated based on estimated truck volumes developed from the annual delivered product volume from each facility and assumptions regarding the number of delivery days and typical truck capacity. Dredging operations typically occur 10 months per year. Truck deliveries can occur 10–12 months per year. Truck deliveries have been estimated assuming 10 months per year to provide a conservative estimate of daily truck trips. Table 3.13-7 summarizes the assumptions and estimated truck noise levels for existing conditions. Similar tables have been developed for the Proposed Action and each alternative.

#### 4.11.2.4 Operations at Alternate Source Locations

Reductions in the quantity of sand and gravel dredged from the LOMR under the alternatives would need to be replaced by alternate sources. Over the long term, new sources likely would be developed near existing processing facilities and urban centers, which represent the largest sources of demand for construction sand and gravel. New mining operations likely would be located in the floodplain adjacent to the LOMR, which has comparable sand deposits and would allow use of dredging equipment that currently is used in river dredging. In the short term, however, replacement supplies likely would need to come from existing sources based on the extended startup period for new mines.

Alternate sources of sand and gravel include dredging from the Kansas or Mississippi River. Other sources of sand and gravel include floodplain open-pit mines and quarries, instream sand and gravel mines, and manufactured sand. Because of the speculative nature of when and where alternate sources would operate, potential noise impacts associated with alternate sources are discussed qualitatively.

### 4.11.3 Proposed Action

#### 4.11.3.1 Short-Term Exposure of Noise-Sensitive Land Uses to Noise from Construction of New Facilities

##### *St. Joseph Segment*

No new facilities would be constructed in the St. Joseph segment. Therefore, no exceedances of the noise thresholds from construction of new facilities are expected in this segment under the Proposed Action.

##### *Kansas City Segment*

Under the Proposed Action, The Master's Dredging Company would construct a new facility (Master's–Waldron) in the Kansas City segment. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. No noise-sensitive land uses (including residences) are located within these distances at the proposed sand plant site. Accordingly, no exceedances of the noise thresholds from construction of new facilities are expected at this location.

##### *Waverly and Jefferson City Segments*

No new facilities would be constructed in the Waverly or Jefferson City segment. Therefore, no exceedances of the noise thresholds from construction of new facilities are expected in these segments under the Proposed Action.

##### *St. Charles Segment*

Under the Proposed Action, Edward N. Rau Contractor Company would construct a new facility (Rau–Washington) in the St. Charles segment. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. The Rau–Washington facility would be located within approximately 250 feet of existing residences, indicating the potential for construction activity at the proposed facility to result in noise levels that exceed the thresholds at nearby residences.

### *Alternate Sources*

New facilities would not be constructed at alternate source locations under the Proposed Action. Therefore, no noise-sensitive land uses near alternate sources would experience short-term exposure to noise from construction of dredging-related facilities.

#### 4.11.3.2 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Dredging

Tables 3.13-5 and 3.13-6 in Section 3.13 show the tug and dredging equipment used by each Dredger and the estimated noise level produced by each piece of equipment. These tables also show the distance within which noise from each tug or dredge is estimated to exceed 65 dBA- $L_{eq}$ . Table 4.11-2 summarizes this information by Dredger within each segment. Table 4.11-2 also identifies general locations of residential neighborhoods that potentially experience noise levels exceeding 65 dBA- $L_{eq}$ .

#### *St. Joseph Segment*

Tug and dredging equipment would operate in areas in the St. Joseph segment that have been dredged in recent years but likely would need to operate in areas not dredged in recent years to accommodate the increased amount of material that would be dredged under the Proposed Action. Although noise produced by individual tugs and dredges is not anticipated to increase, noise-sensitive land uses that are not currently exposed to dredging operation noise potentially could be exposed to noise from the expanded operations that would occur under the Proposed Action. Residences located within the distances indicated in Table 4.11-2 could be exposed to adverse noise effects that exceed the 65-dBA- $L_{eq}$  threshold. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

#### *Kansas City Segment*

Tug and dredging equipment would operate in areas in the Kansas City segment that have been dredged in recent years but likely would need to operate in areas not dredged in recent years to accommodate the increased amount of material that would be dredged under the Proposed Action. In addition, new dredging operations near the Master's–Waldron facility could result in dredging in areas that are outside the recently dredged areas. Although noise produced by individual tugs and dredges is not anticipated to increase, noise-sensitive land uses that are not currently exposed to dredging operation noise potentially could be exposed to noise from the expanded operations that would occur under the Proposed Action. Residences located within the distances indicated in Table 4.11-2 could be exposed to adverse noise effects that exceed the 65-dBA- $L_{eq}$  threshold. If dredging does not expand

beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

**Table 4.11-2 Summary of Noise Levels Produced by Tugs and Dredges for Each Dredger**

Company Name (Facility)	River Mile	Distance (ft) within Which Tug Noise Could Exceed 65 dB- $L_{eq}^c$	Residential Areas Potentially Affected by Tug Noise	Distance (ft) within Which Dredge Noise Could Exceed 65 dB- $L_{eq}^c$	Residential Areas Potentially Affected by Dredge Noise
<b>St. Joseph Segment</b>					
Holliday Sand & Gravel Company (St. Joseph)	447.8	1,000–1,410	10–20 residences 2 miles upriver on north bank in St. Joseph, MO  10–20 residences 2.75 miles downriver on southeast bank in St. Joseph, MO	560–890	5–10 residences 2.75 miles downriver on southeast bank in St. Joseph, MO
<b>Kansas City Segment</b>					
The Master's Dredging Company (Waldron)	385	0 (no tugs) <sup>a</sup>	None	800–1,260	None
Holliday Sand & Gravel Company (Riverside)	372	1,000–1,410	None	560–890	None
Holliday Sand & Gravel Company (Randolph)	360	1,000–1,410	None	560–890	None
<b>Waverly Segment</b>					
Capital Sand Company (Lexington)	317.5	890–1,120	5–10 residences 2 miles downriver on east bank in Lexington, MO	560–630	None
Capital Sand Company (Carrollton)	287	890–1,120	25–50 residences 6 miles upriver of facility on southeast bank in Waverly, MO	560–630	5–10 residences 6 miles upriver of facility on southeast bank in Waverly, MO
<b>Jefferson City Segment</b>					
Capital Sand Company–St. Louis (Glasgow)	226.2	890–1,120	50–100 residences 0.25 mile upriver on northeast bank in Glasgow, MO	560–630	25–50 residences 0.25 mile upriver on northeast bank in Glasgow, MO
Capital Sand Company–St. Louis (Boonville)	196.2	890–1,120	25–50 residences 0.75 mile upriver on east bank in Boonville, MO  10–25 residences 0.5 mile downriver on east bank in Boonville, MO	560 to 630	5–10 residences approximately 0.75 mile upriver on east bank in Boonville, MO  5–10 residences 0.5 mile downriver on east bank in Boonville, MO

**Table 4.11-2 Summary of Noise Levels Produced by Tugs and Dredges for Each Dredger**

Company Name (Facility)	River Mile	Distance (ft) within Which Tug Noise Could Exceed 65 dB- $L_{eq}^c$	Residential Areas Potentially Affected by Tug Noise	Distance (ft) within Which Dredge Noise Could Exceed 65 dB- $L_{eq}^c$	Residential Areas Potentially Affected by Dredge Noise
<b>Jefferson City Segment (continued)</b>					
Capital Sand Company–St. Louis (Rocheport)	186.5	890–1,120	10–25 residences 9 miles upriver on east bank in Boonville, MO  5–10 residences 0.5 mile downriver on north bank in Rocheport, MO	560 to 630	5–10 residences 9 miles upriver on east bank in Boonville, MO
Hermann Sand & Gravel (Jefferson City)	146.5	800–1,120	250–500 residences 1–3 miles downriver on south bank in Jefferson City, MO	500	25–50 residences 1–3 miles downriver on south bank in Jefferson City, MO
Capital Sand Company–St. Louis (Jefferson City)	143.5	890–1,120	250–500 residences 0–2 miles upriver on south bank in Jefferson City, MO  25–50 residences 2.5 miles downriver on south bank in Jefferson City, MO	560 to 630	25–50 residences 0–2 miles upriver on south bank in Jefferson City, MO  10–25 residences 2.5 miles downriver on south bank in Jefferson City, MO
<b>St. Charles Segment</b>					
Hermann Sand & Gravel (Hermann)	97	800–1,120	5–10 residences 7.5 miles upriver on east bank in Gasconade, MO  75–150 residences 0.5–1.5 miles upriver on east bank in Hermann, MO	500	5–10 residences 0.5–1.5 miles upriver on east bank in Hermann, MO
Edward N. Rau Contractor Company (Washington) <sup>b</sup>	68	800–1,200 <sup>b</sup>	25-50 residences 0.0–0.5 mile upriver on south bank in Washington, MO  50–100 residences 0-1 mile downriver on south bank in Washington, MO	500 <sup>b</sup>	Approx. 5–10 residences 0.0–0.5 mile upriver on south bank in Washington, MO
Capital Sand Company–St. Louis (Washington)	66	890–1,120	50–100 residences 1.5–3.0 miles upriver on south bank in Washington, MO	560 to 630	5–10 residences 3.0–3.5 miles upriver on south bank in Washington, MO

**Table 4.11-2 Summary of Noise Levels Produced by Tugs and Dredges for Each Dredger**

Company Name (Facility)	River Mile	Distance (ft) within Which Tug Noise Could Exceed 65 dB- $L_{eq}^c$	Residential Areas Potentially Affected by Tug Noise	Distance (ft) within Which Dredge Noise Could Exceed 65 dB- $L_{eq}^c$	Residential Areas Potentially Affected by Dredge Noise
<b>St. Charles Segment (continued)</b>					
Limited Leasing Company (Bridgeton)	44	1,000–1,775	None	500	None
J.T. R. (St. Charles)	31.5	800–1,360	50–100 residences 0.75 mile upriver on west bank in St. Charles, MO  25–50 residences 2 miles upriver on west bank in St. Charles, MO	560	5–10 residences 2 miles upriver on west bank in St. Charles, MO
Limited Leasing Company (Chesterfield)	28	1,000–1,775	25–50 residences 1.25 miles upriver on west bank in St. Charles, MO  50–100 residences 4 miles upriver on west bank in St. Charles, MO  25–50 residences 5 miles upriver on west bank in St. Charles, MO	500	5–10 residences 5 miles upriver on west bank in St. Charles, MO
J.T.R. (Riverview)	16.5	800–1,360	10–25 residences 3 miles upriver on east bank in Florissant, MO	560	None
Limited Leasing Company (Fort Belle)	8	1,000–1,775	50–100 residences 0-1.5 miles upriver on south bank in Black Jack, MO	500	10–25 residences 0–1.5 miles upriver on south bank in Black Jack, MO

<sup>a</sup> The Master's Dredging Company would operate a system that pumps dredged material directly from the river as slurry to the processing plant. It would not operate any tugs.

<sup>b</sup> Edward N. Rau Contractor Company would not operate any tugs or dredges. The company would contract with Hermann Sand & Gravel Company or another Dredger to dredge for them near their Washington facility. Tug/dredging noise levels for Hermann equipment are indicated.

<sup>c</sup> This assumes that tugs and dredges are operating at a fixed distance from a noise-sensitive use for at least 1 hour. Tug operations typically are associated with movement of dredges and barges and therefore typically are transitory. As such, distances within which tug noise would exceed 65 dB- $L_{eq}$  typically would be much less than the amount shown.

***Waverly and Jefferson City Segments***

Tug and dredging equipment would operate in areas in the Waverly and Jefferson City segments that have been dredged in recent years but likely would need to operate in areas not dredged in recent years to accommodate the increased amount of material that would be dredged under the Proposed Action. Although noise produced by individual tugs and dredges is not anticipated to increase, noise-

sensitive land uses that are not currently exposed to dredging operation noise could be exposed to noise from the expanded operations that would occur under this alternative. Residences located within the distances indicated in Table 4.11-2 could be exposed to adverse noise effects that exceed the 65-dBA-Leq threshold. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

### *St. Charles Segment*

Tug and dredging equipment would operate in areas in the St. Charles segment that have been dredged in recent years but likely would need to operate in areas not dredged in recent years to accommodate the increased amount of material that would be dredged under the Proposed Action. In addition, new dredging operations near the Rau–Washington facility could result in dredging in areas that have not been dredged in recent years. Although noise produced by individual tugs and dredges is not anticipated to increase, noise-sensitive land uses that are not currently exposed to dredging operation noise could be exposed to noise from the expanded operations that would occur under the Proposed Action. Residences located within the distances indicated in Table 4.11-2 could be exposed to adverse noise effects that exceed the 65-dBA-Leq threshold. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-3.

### *Alternate Sources*

Dredging would not increase at alternate source locations under the Proposed Action. Therefore, no noise-sensitive land uses near alternate sources would experience long-term exposure to noise from additional dredging operations.

#### 4.11.3.3 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Processing Facility Operations

Table 4.11-3 summarizes the projected annual tons of material that would be delivered from each facility within each segment under the Proposed Action. The table also shows the estimated distance to the 65-L<sub>dn</sub> contour. The contour distance is then compared to the distance to the nearest residence to determine whether an adverse effect (i.e., a noise level above the threshold) has the potential to occur. Table 4.11-3 indicates the potential for operations at several facilities to result in noise levels at residences that exceed the threshold.

**Table 4.11-3 Summary of Facility Processing and Haul Truck Noise – Proposed Action**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level (L <sub>eq</sub> at 50 ft) <sup>a</sup>	Distance to Processing Noise 65-L <sub>dn</sub> Contour (ft)	Distance to Nearest Residence (ft)	65-L <sub>dn</sub> Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips Per Day	Haul Truck Noise Level (L <sub>dn</sub> at 50 ft) <sup>d</sup>
<b>St. Joseph Segment</b>										
Holliday Sand & Gravel Company (St. Joseph)	447.8	1,150,000	94	1350	850	Yes	5324	266	532	61
<b>Kansas City Segment</b>										
The Master's Dredging Company (Waldron) <sup>e</sup>	385	1,000,000	93	1,259	3,300	No	4,630	231	463	61
Holliday Sand & Gravel Company (Riverside)	372	1,669,668	95	1627	2,900	No	7730	386	773	63
Holliday Sand & Gravel Company (Randolph)	360	1,730,332	95	1656	3,800	No	8011	401	801	63
<b>Waverly Segment</b>										
Capital Sand Company (Lexington)	317.5	624,275	91	995	2,700	No	2890	145	289	59
Capital Sand Company (Carrollton)	287	41,325	87	629	4,000	No	191	10	19	50
<b>Jefferson City Segment</b>										
Capital Sand Company–St. Louis (Glasgow)	226.2	202,519	87	629	600	Yes	938	47	94	54
Capital Sand Company–St. Louis (Boonville)	196.2	16,850	87	629	1,900	No	78	4	8	48
Capital Sand Company–St. Louis (Rocheport)	186.5	405,281	89	801	1,350	No	1876	94	188	57
Hermann Sand & Gravel (Jefferson City)	146.5	500,000	90	890	5,200	No	2,315	116	231	58
Capital Sand Company–St. Louis (Jefferson City)	143.5	1,625,350	95	1605	1,900	No	7525	376	752	63

**Table 4.11-3 Summary of Facility Processing and Haul Truck Noise – Proposed Action**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level (L <sub>eq</sub> at 50 ft) <sup>a</sup>	Distance to Processing Noise 65-L <sub>dn</sub> Contour (ft)	Distance to Nearest Residence (ft)	65-L <sub>dn</sub> Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips Per Day	Haul Truck Noise Level (L <sub>dn</sub> at 50 ft) <sup>d</sup>
<b>St. Charles Segment</b>										
Hermann Sand & Gravel (Hermann)	97	500,000	90	890	1,900	No	2,315	116	231	58
Edward N. Rau Contractor Company (Washington) <sup>f</sup>	68	100,000	87	629	250	Yes	463	23	46	52
Capital Sand Company–St. Louis (Washington)	66	1,304,000	93	1280	1,700	No	4789	239	479	61
Limited Leasing Company (Bridgeton)	44	350,000	88	745	2,800	No	1,620	81	162	57
J.T. R. (St. Charles)	31.5	1,348,775	94	1,462	600	Yes	6,244	312	624	62
Limited Leasing Company (Chesterfield)	28	650,000	91	1,015	2,400	No	3,009	150	301	59
J.T.R. (Riverview)	16.5	201,225	87	629	2,300	No	932	47	93	54
Limited Leasing Company (Fort Belle)	8	100,000	87	629	850	No	463	23	46	52

<sup>a</sup> Based on a processing source level of 90 dBA-L<sub>eq</sub> at 50 feet and continuous operation between 7:00 a.m and 7:00 p.m. (87 L<sub>dn</sub> at 50 ft) for facilities producing 250,000 tons/year or less. For larger facilities, the source noise level was scaled up based on the amount of production in excess of 250,000 tons/yr. As discussed in Section 3.14.2, a doubling of sound energy corresponds to a 3-dB increase in noise. Therefore, a doubling of delivered product volume was assumed to result in a 3-dB increase in facility noise.

<sup>b</sup> Assumes 216 delivery days per year (10 months of operation per year 5 days a week). Deliveries can occur 10–12 months per year. Assuming 10 months provides a conservative estimate of daily truck volumes and noise.

<sup>c</sup> Assumes average truck capacity of 20 tons.

<sup>d</sup> Calculated using FHWA Traffic Noise Model Version 2.1 assuming: average truck speed of 45 miles per hour (mph) on local road near plant.

-Two truck trips (out and in from facility) per delivery.

-Daily truck trips equally distributed over eight-hour work day during daytime hours.

-Average truck speed of 45 mph on local road near plant.

<sup>e</sup> New proposed facility.

Table 4.11-3 also shows the noise level predicted to result from trucking operations. The predicted traffic noise level at 50 feet from the roadway is identified. In no case is traffic noise predicted to exceed 65  $L_{dn}$  at 50 feet. Because noise-sensitive uses typically would be located at least this distance from the roadway, no adverse effects from trucking are anticipated.

### *St. Joseph Segment*

Under the Proposed Action, noise levels would exceed the 65- $L_{dn}$  threshold at the residences closest to the Holliday–St. Joseph facility in the St. Joseph segment.

### *Kansas City and Waverly Segments*

Under the Proposed Action, noise levels would not exceed the 65- $L_{dn}$  threshold at the nearest residences to any of the facilities in the Kansas City or Waverly segment.

### *Jefferson City Segment*

Under the Proposed Action, the 65- $L_{dn}$  threshold would be exceeded at the residences closest to the Capital–Glasgow facility in the Jefferson City segment.

### *St. Charles Segment*

Under the Proposed Action, the 65- $L_{dn}$  threshold would be exceeded at the residences closest to the J.T.R.–St. Charles facility and the proposed Rau–Washington facility in the St. Charles segment.

### *Alternate Sources*

Processing would not increase at alternate source locations under the Proposed Action. Therefore, no noise-sensitive land uses near alternate sources would experience long-term exposure to noise from additional processing operations.

## 4.11.4 No Action Alternative

### 4.11.4.1 Short-Term Exposure of Noise-Sensitive Land Uses to Noise from Construction of New Facilities

#### *All Segments*

Under the No Action Alternative, no new facilities would be constructed in any segment. Therefore, no noise levels would exceed thresholds due to new dredging-related construction.

### *Alternate Sources*

In the short term, new alternate source facilities likely would not be constructed. Replacement supplies probably would need to come from existing sources, based on the extended startup period for new mining operations.

In the long term, new sources of material likely would be developed near existing processing facilities and urban centers, which represent the largest sources of demand for construction sand and gravel. New mining operations likely would be located in the floodplain adjacent to the LOMR. Alternate sources of sand and gravel include dredging from the Kansas or Mississippi River, open-pit mining in the LOMR floodplain, instream mining in the LOMR, and manufactured sand.

Development of floodplain or instream mining operations could involve construction of new facilities. Expansion of existing facilities along the Kansas and Mississippi Rivers also could involve construction activities. It is not possible at this time to identify specifically where this potential construction activity could occur. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold.

#### 4.11.4.2 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Dredging and Mining

### *All Segments*

No dredging would occur under the No Action Alternative. Noise levels in the segments would decrease due to the decrease in general activity, equipment use, dredge operations, and barges and tugs associated with dredging.

### *Alternate Sources*

Noise generated by alternate source mining operations would vary depending on the type of mining, timing, and location. It is not possible at this time to identify specifically where new or expanded mining would occur. Table 4.11-3 provides a general indication of the distance within which 65 dBA- $L_{eq}$  can be exceeded near facility operations of various sizes. This indicates that there is potential for new or expanded mining operations to expose nearby noise-sensitive uses to noise exceeding 65 dBA- $L_{eq}$ .

#### 4.11.4.3 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Processing Facility Operations

##### *All Segments*

No processing operations would occur in any segment under the No Action Alternative. Noise levels in the segments would decrease due to the decrease in processing.

##### *Alternate Sources*

Noise generated by processing at alternate source locations would vary depending on the type of processing, timing, and location of facilities. At this time it is not possible to identify specifically where new or expanded mining would occur. Processing in the short term and at the combined existing and new alternate source facilities in the long term could result in additional noise level exceedances at nearby noise-sensitive land uses.

#### 4.11.5 Alternative A

##### 4.11.5.1 Short-Term Exposure of Noise-Sensitive Land Uses to Noise from Construction of New Facilities

##### *St. Joseph Segment*

No new facilities would be constructed in the St. Joseph segment under Alternative A. Therefore, no exceedances of the noise thresholds from construction of new facilities are expected in this segment.

##### *Kansas City Segment*

Under Alternative A, The Master's Dredging Company would construct a new facility (Master's-Waldron) in the Kansas City segment. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. No noise-sensitive land uses are located within these distances at the proposed facility site. Accordingly, no exceedances of the noise thresholds from construction of new facilities are expected at this location.

### *Waverly and Jefferson City Segments*

No new facilities would be constructed in the Waverly or Jefferson City segment under Alternative A. Therefore, no exceedances of the noise thresholds from construction of new facilities are expected in these segments.

### *St. Charles Segment*

Under Alternative A, Edward N. Rau Contractor would construct a new facility (Rau–Washington) in the St. Charles segment. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. The Rau–Washington facility would be located within approximately 250 feet of existing residences, indicating the potential for construction activity at the proposed facility to result in noise levels that exceed the thresholds at nearby residences.

### *Alternate Sources*

In the short term, replacement supplies would probably need to come from existing sources, based on the extended startup period for new mining operations. In the long term, development of floodplain or instream mining operations could involve the construction of new facilities. Expansion of existing facilities along the Kansas and Mississippi Rivers also could involve construction activities. It is not possible at this time to identify specifically where this potential construction activity could occur. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold.

#### 4.11.5.2 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Dredging and Mining

Tables 3.13-5 and 3.13-6 show the tug and dredging equipment used by each Dredger, along with the estimated noise level produced by each piece of equipment. These tables also show the distance within which noise from each tug or dredge is estimated to exceed 65 dBA- $L_{eq}$ . Table 4.11-2 summarizes this information by Dredger within each segment.

### *St. Joseph Segment*

Under Alternative A, production would increase by 7 percent in the St. Joseph segment. Noise-sensitive land uses that have not been exposed to noise from dredging operations in recent years could become exposed to noise from these dredging operations. Residences located within the distances shown in Table 4.11-2 could be exposed to adverse noise effects. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

### *Kansas City, Waverly, Jefferson City, and St. Charles Segments*

Under Alternative A, material production would be 27–80 percent less than existing conditions in the Kansas City, Waverly, Jefferson City, and St. Charles Segments, accounting for the new Rau–Washington facility in the St. Charles Segment. Overall, dredging equipment would operate in areas that have been dredged in recent years and probably would not need to operate beyond recently dredged areas. Noise produced by tugs and dredges is not anticipated to change. Although with reduced activity, there generally would be less opportunity for noise-sensitive uses to be exposed to excessive noise, certain noise-sensitive land uses not exposed to dredging operation noise in recent years could become exposed to additional noise under Alternative A. Residences located within the distances shown in Table 4.11-2 could be exposed to threshold-exceeding noise levels. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

### *Alternate Sources*

In the short term, replacement supplies would probably need to come from existing sources, based on the extended startup period for new mining operations. In the long term, development of floodplain or instream mining operations could involve the construction of new facilities. Expansion of existing facilities along the Kansas and Mississippi Rivers also could involve construction activities. It is not possible at this time to identify specifically where new or expanded dredging or mining operations would occur. Table 4.11-3, however, does provide a general indication of the distance within which 65 dBA- $L_{eq}$  can be exceeded near facility operations of various sizes. This indicates that there is potential for new or expanded dredging operations to expose nearby noise-sensitive land uses to noise exceeding 65 dBA- $L_{eq}$ .

### 4.11.5.3 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Processing Facility Operations

Table 4.11-4 summarizes the projected annual tons of material that would be delivered from each facility within each segment under Alternative A. From this information, a reference noise level generated by operation of each facility has been developed. The distance to the 65- $L_{dn}$  contour has been developed from this reference distance. The contour distance is compared to the distance to the nearest residences, in order to determine whether an adverse effect (i.e., a noise level above the threshold) potentially would occur. Table 4.11-4 indicates the potential for operations at several facilities to result in noise levels at residences that exceed the threshold.

Table 4.11-4 also shows the noise level predicted to result from trucking operations under Alternative A. The predicted traffic noise level at 50 feet from the roadway is identified. In no case is traffic noise predicted to exceed 65  $L_{dn}$  at 50 feet. Because noise-sensitive uses typically would be located at least this distance from the roadway, no adverse effects from trucking are anticipated under Alternative A.

#### *St. Joseph, Kansas City, and Waverly Segments*

Under Alternative A, noise levels would not exceed thresholds at the residences nearest any of the facilities in the St. Joseph, Kansas City, or Waverly segment.

#### *Jefferson City Segment*

Under Alternative A, noise levels would be exceeded in the Jefferson City segment at the residences closest to the Capital–Glasgow facility.

#### *St. Charles Segment*

Under Alternative A, noise levels would be exceeded at the residences closest to the J.T.R.–St. Charles facility and the new Rau–Washington facility in the St. Charles segment.

**Table 4.11-4 Summary of Facility Processing and Haul Truck Noise – Alternative A**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level ( $L_{eq}$ at 50 ft) <sup>a</sup>	Distance to Processing Noise 65 $L_{dn}$ Contour (feet)	Distance to Nearest Residence (feet)	65 $L_{dn}$ Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips Per Day	Haul Truck Noise Level ( $L_{dn}$ at 50 feet) <sup>d</sup>
<b>St. Joseph Segment</b>										
Holliday Sand & Gravel Company (St. Joseph)	447.8	350,000	88	745	850	No	1620	81	162	57
<b>Kansas City Segment</b>										
The Master's Dredging Company (Waldron) <sup>e</sup>	385	153,031	87	629	3,300	No	708	35	71	53
Holliday Sand & Gravel Company (Riverside)	372	211,147	87	629	2,900	No	978	49	98	55
Holliday Sand & Gravel Company (Randolph)	360	354,313	89	749	3,800	No	1640	82	164	57
<b>Waverly Segment</b>										
Capital Sand Company (Lexington)	317.5	301,604	88	691	2,700	No	1396	70	140	56
Capital Sand Company (Carrollton)	287	19,965	87	629	4,000	No	92	5	9	48
<b>Jefferson City Segment</b>										
Capital Sand Company–St. Louis (Glasgow)	226.2	29,954	87	629	600	Yes	139	7	14	49
Capital Sand Company–St. Louis (Boonville)	196.2	2,492	87	629	1,900	No	12	1	1	47
Capital Sand Company–St. Louis (Rocheport)	186.5	59,944	87	629	1,350	No	278	14	28	51
Hermann Sand & Gravel (Jefferson City)	146.5	97,210	87	629	5,200	No	450	23	45	52
Capital Sand Company–St. Louis (Jefferson City)	143.5	240,000	87	629	1,900	No	1111	56	111	55

**Table 4.11-4 Summary of Facility Processing and Haul Truck Noise – Alternative A**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level ( $L_{eq}$ at 50 ft) <sup>a</sup>	Distance to Processing Noise 65 $L_{dn}$ Contour (feet)	Distance to Nearest Residence (feet)	65 $L_{dn}$ Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips Per Day	Haul Truck Noise Level ( $L_{dn}$ at 50 feet) <sup>d</sup>
<b>St. Charles Segment</b>										
Hermann Sand & Gravel (Hermann)	97	44,719	87	629	1,900	No	207	10	21	50
Edward N. Rau Contractor Company (Washington) <sup>f</sup>	68	8,944	87	629	250	Yes	41	2	4	47
Capital Sand Company–St. Louis (Washington)	66	70,382	87	629	1,700	No	326	16	33	51
Limited Leasing Company (Bridgeton)	44	31,303	87	629	2,800	No	145	7	14	49
J.T. R. (St. Charles)	31.5	120,632	87	629	600	Yes	558	28	56	53
Limited Leasing Company (Chesterfield)	28	58,135	87	629	2,400	No	269	13	27	50
J.T.R. (Riverview)	16.5	17,997	87	629	2,300	No	83	4	8	48
Limited Leasing Company (Fort Belle)	8	8,944	87	629	850	No	41	2	4	47

<sup>a</sup> Based on a processing source level of 90 dBA- $L_{eq}$  at 50 feet and continuous operation between 7:00 a.m and 7:00 p.m. (87  $L_{dn}$  at 50 ft) for facilities producing 250,000 tons/year or less. For larger facilities, the source noise level was scaled up based on the amount of production in excess of 250,000 tons/yr. As discussed in Section 3.14.2, a doubling of sound energy corresponds to a 3-dB increase in noise. Therefore, a doubling of delivered product volume was assumed to result in a 3-dB increase in facility noise.

<sup>b</sup> Assumes 216 delivery days per year (10 months of operation per year 5 days a week). Deliveries can occur 10–12 months per year. (Assuming 10 months provides a conservative estimate of daily truck volumes and noise.)

<sup>c</sup> Assumes average truck capacity of 20 tons.

<sup>d</sup> Calculated using FHWA Traffic Noise Model Version 2.1 assuming: average truck speed of 45 miles per hour (mph) on local road near plant.

- Two truck trips (out and in from facility) per delivery.
- Daily truck trips equally distributed over eight-hour work day during daytime hours.
- Average truck speed of 45 mph on local road near plant.

<sup>e</sup> New proposed facility.

### *Alternate Sources*

In the short term, replacement supplies would probably need to come from existing sources, based on the extended startup period for new mining operations. In the long term, development of floodplain or instream mining operations could involve the construction of new facilities. Expansion of existing facilities along the Kansas and Mississippi Rivers also could involve construction activities. It is not possible at this time to identify specifically where new or expanded processing would occur.

Table 4.11-4 provides a general indication of the distance within which 65 dBA- $L_{eq}$  can be exceeded near facility operations of various sizes. Increased processing in the short term at existing facilities and in the long term at existing and new facilities could result in exposure of nearby noise-sensitive uses to noise levels exceeding 65 dBA- $L_{eq}$ .

#### 4.11.6 Alternative B

##### 4.11.6.1 Short-Term Exposure of Noise-Sensitive Land Uses to Noise from Construction of New Facilities

#### *St. Joseph Segment*

No new facilities would be constructed in the St. Joseph segment under Alternative B. Therefore, no exceedances of the noise thresholds from construction of new dredging-related facilities are expected.

#### *Kansas City Segment*

Under Alternative B, Waldron (Master's) would construct a new facility in the Kansas City segment. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. No noise-sensitive land uses are located within these distances at the proposed project site. Accordingly, no exceedances of the noise thresholds from construction of new facilities are expected at this location.

#### *Waverly and Jefferson City Segments*

Under Alternative B, no new facilities would be constructed in the Waverly or Jefferson City segment. Therefore, no exceedances of the noise thresholds from construction of new facilities are expected.

### *St. Charles Segment*

Under Alternative B, Washington (Rau) would construct a new facility in the St. Charles segment. Table 4.11-2 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. The Rau facility would be located within approximately 250 feet of existing residences, indicating the potential for construction activity at the proposed Rau facility to result in noise levels that exceed the thresholds at nearby residences.

### *Alternate Sources*

In the short term under Alternative B, replacement supplies would probably need to come from existing sources, based on the extended startup period for new mining operations. Alternate sources of sand and gravel include dredging from the Kansas or Mississippi River, open-pit mining in the LOMR floodplain, instream mining in the LOMR, and manufactured sand. Development of floodplain or instream mining operations could involve the construction of new facilities. Expansion of existing facilities along the Kansas and Mississippi Rivers also could involve construction activities. It is not possible at this time to identify specifically where this potential construction activity could occur. Table 4.11-2 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold.

#### 4.11.6.2 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Dredging and Mining

Tables 3-13.5 and 3.13-6 show the tug and dredging equipment used by each operator along with the estimated noise level produced by each piece of equipment. These tables also show the distance within which noise from each tug or dredge is estimated to exceed 65 dBA- $L_{eq}$ . Table 4.11-3 summarizes this information by operator within each segment.

### *St. Joseph and Waverly Segments*

Relative to existing conditions, production would increase by 163 percent in the St. Joseph segment and by 68 percent in the Waverly segment under Alternative B. Noise-sensitive land uses that have not been exposed to dredging operation noise in recent years could become exposed to noise from these dredging operations. Residences located within the distances shown in Table 4.11-2 could be exposed

to adverse noise effects. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

### *Kansas City, Jefferson City, and St. Charles Segments*

Under Alternative B, production would be from 38 to 53 percent less than existing conditions in the Kansas City, Jefferson City, and St. Charles segments, accounting for the new Rau Washington facility in the St. Charles segment. The reduced activity generally would result in less opportunity for noise-sensitive uses to be exposed to excessive noise. Residences located within the distances shown in Table 4.11-2 could be exposed to noise levels that exceed thresholds. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

### *Alternate Sources*

It is not possible at this time to identify specifically where new or expanded dredging or mining would occur. Table 4.11-4 indicates the distance within which 65 dBA- $L_{eq}$  can be exceeded near facility operations of various sizes, and the potential for new or expanded dredging operations to expose nearby noise-sensitive use to noise exceeding 65 dBA- $L_{eq}$ .

#### 4.11.6.3 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Processing Facility Operations

Table 4.11-5 summarizes the projected annual tons of material that would be delivered from each facility within each segment under Alternative B. From this information, a reference noise level generated by operation of each facility has been developed. The distance to the 65- $L_{dn}$  contour has been developed from this reference distance. The contour distance is compared to the distance from the nearest residences to determine whether an adverse effect (i.e., a noise level above the threshold), potentially would occur. Table 4.11-5 indicates the potential for operations at several facilities to result in noise levels at residences that exceed the threshold.

Table 4.11-5 shows the noise level predicted to result from trucking operations under Alternative B. The predicted traffic noise level at 50 feet from the roadway is identified. In no case is traffic noise predicted to exceed 65  $L_{dn}$  at 50 feet. Because noise-sensitive uses typically would be located at least this distance from the roadway, no adverse effects from trucking are anticipated under Alternative B.

### *St. Joseph Segment*

Under Alternative B, noise levels from processing facility operations would be exceeded at the residences closest to the St. Joseph (Holliday) facility.

### *Kansas City and Waverly Segments*

Under Alternative B, noise levels from processing facility operations would not exceed thresholds at the residences nearest any of the facilities in the Kansas City or Waverly segment.

### *Jefferson City Segment*

Under Alternative B, noise levels from processing facility operations would be exceeded at the residences closest to the Glasgow (Capital) facility.

### *St. Charles Segment*

Under Alternative B, noise levels from processing facility operations would be exceeded at the residences closest to the St. Charles (J.T.R.) facility and the new Washington (Rau) facility.

### *Alternate Sources*

It is not possible at this time to identify specifically where new or expanded processing would occur. Table 4.11-5 provides a general indication of the distance within which 65 dBA- $L_{eq}$  can be exceeded near facility operations of various sizes. In the short term (from existing alternate sources) and in the long term (from existing and new alternate sources), nearby noise-sensitive land uses could be exposed to noise exceeding 65 dBA- $L_{eq}$  from processing facility operations.

## 4.11.7 Alternative C

### 4.11.7.1 Short-Term Exposure of Noise-Sensitive Land Uses to Noise from Construction of New Facilities

#### *St. Joseph Segment*

No new facilities would be constructed in the St. Joseph segment under Alternative C. Therefore, no exceedances of the noise thresholds from construction of new dredging-related facilities are expected.

**Table 4.11-5 Summary of Facility Processing and Haul Truck Noise – Alternative B**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level (L <sub>eq</sub> at 50 ft) <sup>a</sup>	Distance to Processing Noise 65 L <sub>dn</sub> Contour (feet)	Distance to Nearest Residence (feet)	65 L <sub>dn</sub> Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips per Day	Haul Truck Noise Level (L <sub>dn</sub> at 50 feet) <sup>d</sup>
<b>St. Joseph Segment</b>										
Holliday Sand & Gravel Company (St. Joseph)	447.8	860,000	92	1167	850	Yes	3981	199	398	60
<b>Kansas City</b>										
The Master's Dredging Company (Waldron) <sup>e</sup>	385.0	348,570	88	743	3,300	No	3300	1614	81	57
Holliday Sand & Gravel Company (Riverside)	372.0	480,946	90	873	2,900	No	2227	111	223	58
Holliday Sand & Gravel Company (Randolph)	360.0	807,306	92	1131	3,800	No	3738	187	374	60
<b>Waverly Segment</b>										
Capital Sand Company (Lexington)	317.5	687,657	91	1044	2,700	No	3184	159	318	59
Capital Sand Company (Carrollton)	287.0	45,521	87	629	4,000	No	211	11	21	50
<b>Jefferson City Segment</b>										
Capital Sand Company– St. Louis (Glasgow)	226.2	68,267	87	629	600	Yes	315	16	32	51
Capital Sand Company– St. Louis (Boonville)	196.2	5,680	87	629	1,900	No	26	1	3	47
Capital Sand Company– St. Louis (Rocheport)	186.5	136,616	87	629	1,350	No	632	32	63	53
Hermann Sand & Gravel (Jefferson City)	146.5	221,548	87	629	5,200	No	1026	51	103	55
Capital Sand Company– St. Louis (Jefferson City)	143.5	547,889	90	1046	1,900	No	2537	127	254	58

**Table 4.11-5 Summary of Facility Processing and Haul Truck Noise – Alternative B**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level ( $L_{eq}$ at 50 ft) <sup>a</sup>	Distance to Processing Noise 65 $L_{dn}$ Contour (feet)	Distance to Nearest Residence (feet)	65 $L_{dn}$ Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips per Day	Haul Truck Noise Level ( $L_{dn}$ at 50 feet) <sup>d</sup>
<b>St. Charles Segment</b>										
Hermann Sand & Gravel (Hermann)	97.0	101,525	87	629	1,900	No	470	24	47	52
Edward N. Rau Contractor Company (Washington) <sup>f</sup>	68.0	20,305	87	629	250	Yes	94	5	9	48
Capital Sand Company– St. Louis (Washington)	66.0	159,785	87	629	1,700	No	740	37	74	54
Limited Leasing Company (Bridgeton)	44.0	71,067	87	629	2,800	No	329	16	33	51
J.T. R. (St. Charles)	31.5	273,868	87	629	600	Yes	1,268	63	127	56
Limited Leasing Company (Chesterfield)	28.0	131,982	87	629	2,400	No	611	31	61	53
J.T.R. (Riverview)	16.5	40,859	87	629	2,300	No	189	9	19	50
Limited Leasing Company (Fort Belle)	8.0	20,305	87	629	850	No	94	5	9	48

<sup>a</sup> Based on a processing source level of 90 dBA- $L_{eq}$  at 50 feet and continuous operation between 7:00 a.m and 7:00 p.m. (87  $L_{dn}$  at 50 ft) for facilities producing 250,000 tons/year or less. For larger facilities, the source noise level was scaled up based on the amount of production in excess of 250,000 tons/yr. As discussed in Section 3.14.2, a doubling of sound energy corresponds to a 3-dB increase in noise. Therefore, a doubling of delivered product volume was assumed to result in a 3-dB increase in facility noise.

<sup>b</sup> Assumes 216 delivery days per year (10 months of operation per year 5 days a week). Deliveries can occur 10–12 months per year. Assuming 10 months provides a conservative estimate of daily truck volumes and noise.

<sup>c</sup> Assumes average truck capacity of 20 tons.

<sup>d</sup> Calculated using FHWA Traffic Noise Model Version 2.1 assuming: average truck speed of 45 miles per hour (mph) on local road near plant.

- Two truck trips (out and in from facility) per delivery.
- Daily truck trips equally distributed over eight-hour work day during daytime hours.
- Average truck speed of 45 mph on local road near plant.

<sup>e</sup> New proposed facility.

### *Kansas City Segment*

Under Alternative C, Waldron (Master's) would construct a new facility in the Kansas City segment. Table 4.11-1 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. No noise-sensitive land uses are located within these distances at the proposed site. Accordingly, no exceedances of the noise thresholds from construction of new facilities are expected at this location.

### *Waverly and Jefferson City Segments*

Under Alternative C, no new facilities would be constructed in the Waverly or Jefferson City segment. Therefore, no exceedances of the noise thresholds from construction of new dredging-related facilities are expected.

### *St. Charles Segment*

Under Alternative C, Washington (Rau) would construct a new facility in the St. Charles segment. Table 4.11-2 indicates that noise-sensitive land uses located within approximately 500–900 feet of active construction could be exposed to noise exceeding the 65-dBA- $L_{eq}$  nighttime threshold, and residences located within approximately 160–280 feet of active construction could be exposed to noise exceeding the 75-dBA- $L_{eq}$  daytime threshold. The Rau facility would be located within approximately 250 feet of existing residences, indicating the potential for construction activity at the proposed Rau facility to result in noise levels that exceed the thresholds at nearby residences. .

### *Alternate Sources*

Demand for sand and gravel under Alternative C would be the same as under existing conditions. Therefore, new facilities would not be constructed at alternate source locations and exceedances of noise thresholds from construction of new dredging-related facilities would not occur.

## 4.11.7.2 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Dredging Operations

### *All Segments*

Tables 3.13-5 and 3.13-6 show the tug and dredging equipment used by each Dredger along with the estimated noise level produced by each piece of equipment. These tables also show the distance

within which noise from each tug or dredge is estimated to exceed 65 dBA- $L_{eq}$ . Table 4.11-2 summarizes this information by Dredger within each segment.

Under Alternative C, production within each segment would remain at current levels. Noise produced by tugs and dredges is not anticipated to change. By maintaining the existing production levels in each segment, there generally would be little potential for residences not recently exposed to dredging noise to be exposed to dredging noise under Alternative C. Table 4.11-2 shows areas potentially exposed to noise in excess of 65 dBA under recent dredging conditions. If dredging does not expand beyond areas dredged in recent years, areas potentially exposed to noise in excess of 65 dBA would be the same as indicated in Table 4.11-2.

### *Alternate Sources*

Alternative C would not require additional dredging at alternate source locations. Therefore, noise level exceedances due to additional dredging at alternate source locations would not occur.

#### 4.11.7.3 Long-Term Exposure of Noise-Sensitive Land Uses to Noise from Processing Facility Operations

Table 4.11-6 summarizes the projected annual tons of material that would be delivered from each facility in each segment under Alternative C. From this information, a reference noise level generated by operation of each facility has been developed. The distance to the 65- $L_{dn}$  contour has been developed from this reference distance. The contour distance is compared to the distance to the nearest residences to determine whether an adverse effect (i.e., a noise level above the threshold) has the potential to occur. Table 4.11-6 indicates the potential for operations at several facilities to result in an adverse effect.

Table 4.11-6 also shows the noise level predicted to result from trucking operations under Alternative C. The predicted traffic noise level at 50 feet from the roadway is identified. In no case is traffic noise predicted to exceed 65  $L_{dn}$  at 50 feet. Because noise-sensitive uses typically would be located at least this distance from the roadway, no adverse effects from trucking are anticipated.

### *St. Joseph, Kansas City, and Waverly Segments*

Under Alternative C, noise levels would not exceed thresholds at the residences nearest any of the facilities in the St. Joseph, Kansas City, or Waverly segment.

**Table 4.11-6 Summary of Facility Processing and Haul Truck Noise – Alternative C**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level (L <sub>eq</sub> at 50 ft) <sup>a</sup>	Distance to Processing Noise 65 L <sub>dn</sub> Contour (feet)	Distance to Nearest Residence (feet)	65 L <sub>dn</sub> Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips Per Day	Haul Truck Noise Level (L <sub>dn</sub> at 50 feet) <sup>d</sup>
<b>St. Joseph Segment</b>										
Holliday Sand & Gravel Company (St. Joseph)	447.8	330,000	88	723	850	No	1528	76	153	56
<b>Kansas City Segment</b>										
The Master's Dredging Company (Waldron) <sup>e</sup>	385	753,818	92	1093	3,300	No	3490	174	349	60
Holliday Sand & Gravel Company (Riverside)	372	1,282,761	94	1426	2,900	No	5939	297	594	62
Holliday Sand & Gravel Company (Randolph)	360	866,087	92	1172	3,800	No	4010	200	401	60
<b>Waverly Segment</b>										
Capital Sand Company (Lexington)	317.5	410,182	89	806	2,700	No	1899	95	190	57
Capital Sand Company (Carrollton)	287	27,153	87	629	4,000	No	126	6	13	49
<b>Jefferson City Segment</b>										
Capital Sand Company–St. Louis (Glasgow)	226.2	110,063	87	629	600	Yes	510	25	51	52
Capital Sand Company–St. Louis (Boonville)	196.2	9,157	87	629	1,900	No	42	2	4	47
Capital Sand Company–St. Louis (Rocheport)	186.5	220,258	87	629	1,350	No	1020	51	102	55
Hermann Sand & Gravel (Jefferson City)	146.5	357,190	89	752	5,200	No	1654	83	165	57
Capital Sand Company–St. Louis (Jefferson City)	143.5	883,331	92	1,183	1,900	No	4089	204	409	60

**Table 4.11-6 Summary of Facility Processing and Haul Truck Noise – Alternative C**

Company Name (Facility)	River Mile	Annual Tons Delivered	Facility Reference Noise Level (L <sub>eq</sub> at 50 ft) <sup>a</sup>	Distance to Processing Noise 65 L <sub>dn</sub> Contour (feet)	Distance to Nearest Residence (feet)	65 L <sub>dn</sub> Exceeded at Nearest Residence?	Estimated Tons per Day <sup>b</sup>	Estimated Truck Deliveries Per Day <sup>c</sup>	Trips Per Day	Haul Truck Noise Level (L <sub>dn</sub> at 50 feet) <sup>d</sup>
<b>St. Charles Segment</b>										
Hermann Sand & Gravel (Hermann)	97	199,342	87	629	1,900	No	923	46	92	54
Edward N. Rau Contractor Company (Washington) <sup>e</sup>	68	39,868	87	629	250	Yes	185	9	18	49
Capital Sand Company– St. Louis (Washington)	66	313,736	88	705	1,700	No	1453	73	145	56
Limited Leasing Company (Bridgeton)	44	139,596	87	629	2,800	No	646	32	65	53
J.T. R. (St. Charles)	31.5	537,734	90	923	600	Yes	2491	125	249	58
Limited Leasing Company (Chesterfield)	28	259,250	87	641	2,400	No	1,200	60	120	55
J.T.R. (Riverview)	16.5	80,258	87	629	2,300	No	372	19	37	51
Limited Leasing Company (Fort Belle)	8	39,885	87	629	850	No	185	9	18	49

<sup>a</sup> Based on a processing source level of 90 dBA-L<sub>eq</sub> at 50 feet and continuous operation between 7:00 a.m. and 7:00 p.m. (87 L<sub>dn</sub> at 50 ft) for facilities producing 250,000 tons/year or less. For larger facilities, the source noise level was scaled up based on the amount of production in excess of 250,000 tons/yr. As discussed in Section 3.14.2, a doubling of sound energy corresponds to a 3-dB increase in noise. Therefore, a doubling of delivered product volume was assumed to result in a 3-dB increase in facility noise.

<sup>b</sup> Assumes 216 delivery days per year (10 months of operation per year 5 days a week). Deliveries can occur 10–12 months per year. Assuming 10 months provides a conservative estimate of daily truck volumes and noise.

<sup>c</sup> Assumes average truck capacity of 20 tons.

<sup>d</sup> Calculated using FHWA Traffic Noise Model Version 2.1 assuming: average truck speed of 45 miles per hour (mph) on local road near plant.

- Two truck trips (out and in from facility) per delivery.
- Daily truck trips equally distributed over eight-hour work day during daytime hours.
- Average truck speed of 45 mph on local road near plant.

<sup>e</sup> New proposed facility.

### *Jefferson City Segment*

Under Alternative C, noise levels would be exceeded at the residences closest to the Capital–Glasgow facility in the Jefferson City Segment.

### *St. Charles Segment*

Under Alternative C, noise levels would be exceeded at the residences closest to the J.T.R.–St. Charles facility and the new Rau–Washington facility.

### *Alternate Sources*

Alternative C would not require additional sand and gravel processing at alternate source locations. Therefore, noise level exceedances due to additional processing at alternate source locations would not occur.

#### 4.11.8 Summary of Impacts

Table 4.11-7 presents a summary of potential noise impacts for the Proposed Action and the alternatives.

**Table 4.11-7 Summary of Potential Noise Impacts**

Category of Impact	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Construction impacts	<ul style="list-style-type: none"> <li>• Short-term exposure of noise-sensitive land uses to noise from construction of the Rau facility.</li> </ul>	<ul style="list-style-type: none"> <li>• Potential exposure of noise-sensitive land uses to noise from construction of new alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term exposure of noise-sensitive land uses to noise from construction of the Rau facility.</li> <li>• Potential exposure of noise-sensitive land uses to noise from construction of new alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term exposure of noise-sensitive land uses to noise from construction of the Rau facility.</li> <li>• Potential exposure of noise-sensitive land uses to noise from construction of new alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term exposure of noise-sensitive land uses to noise from construction of the Rau facility.</li> </ul>
Dredging impacts	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from increased dredging operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Decreases in noise levels because dredging would no longer occur.</li> <li>• Potential exposure of noise-sensitive land uses to noise from expanded dredging at alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from slightly increased dredging operations in St. Joseph segment.</li> <li>• Potential exposure of noise-sensitive land uses to noise from expanded dredging at alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from increased dredging operations in St. Joseph and Waverly segments.</li> <li>• Potential exposure of noise-sensitive land uses to noise from expanded dredging at alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Continued long-term exposure of noise-sensitive land uses to noise from dredging operations.</li> </ul>
Processing impacts	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from processing facility operations (St. Joseph, Jefferson City, and St. Charles segments).</li> </ul>	<ul style="list-style-type: none"> <li>• Decreases in noise levels because processing would no longer occur.</li> <li>• Potential exposure of noise-sensitive land uses to noise from expanded processing at alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from processing facility operations (Jefferson City and St. Charles segments).</li> <li>• Potential exposure of noise-sensitive land uses to noise from expanded processing at alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from processing facility operations (St. Joseph, Jefferson City, and St. Charles segments).</li> <li>• Potential exposure of noise-sensitive land uses to noise from expanded processing at alternate sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term exposure of noise-sensitive land uses to noise from processing facility operations (Jefferson City and St. Charles segments).</li> </ul>

#### 4.11.9 References

##### 4.11.9.1 Printed Literature

Bauer and Spencer. 2008. Snapshot of Noise and Worker Exposures in Sand and Gravel Operations. The National Institute for Occupational Safety and Health. Atlanta, GA.

FHWA (Federal Highway Administration). 2006. FHWA Roadway Construction Noise Model User's Guide. Washington, D.C.

FTA (Federal Transit Administration). 2006. Transit Noise and Vibration Impact Assessment. Washington, D.C.

Hoover & Keith. 2000. Noise Control for Buildings and Manufacturing Plants. Houston, TX.

U.S. Army. 2007. Army Regulation 200-1. Environmental Quality Environmental Protection and Enhancement. Washington, D.C.

USEPA (U.S. Environmental Protection Agency). 2004. Hudson River PCBs Superfund Quality of Life Performance Standards. New York, NY.

USEPA (U.S. Environmental Protection Agency). 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. Prepared by Bolt, Beranek, and Newman under Contract 68-04-0047. Office of Noise Abatement and Control, Washington, D.C. December 31.

##### 4.11.9.2 Personal Communication

Zeaman, Bill. Chief, Non-Coal Unit. Missouri Department of Natural Resources, Jefferson City, Missouri. Email to Laura Smith, ICF International. February 9, 2010.