

4.14 AIR QUALITY AND CLIMATE CHANGE

4.14.1 Introduction

This section describes the impact analysis related to air quality and climate change for the Proposed Action and alternatives. As discussed in Section 3.16, operation of dredges, tugboats, and materials-handling equipment powered by internal combustion engines can result in exhaust emissions. Direct impacts from these emissions can include degradation of local and regional air quality, as well as increases in GHGs that contribute to global climate change. Indirect impacts can include potential health risks posed to sensitive receptors following exposure to diesel particulate matter (DPM).

Dredging in the LOMR is a historical and ongoing activity. Air quality and climate change impacts would occur only if implementation of the Proposed Action or alternatives would change the intensity, frequency, number, or location of emission sources. For the purpose of this analysis, emissions generated under the Proposed Action and alternatives were compared to the existing emissions described in Section 3.16.

4.14.2 Assessment Methods

4.14.2.1 Quantification of Emissions

Dredging operations involve the following activities:

- Dredging (removal of sand and gravel from the river bed and transport of that material onshore);
- Onshore materials-handling (use of earth-moving equipment to transport and process the dredged material) and sand plants; and
- Transportation of sand and gravel to local market areas.

Emissions were quantified for each of these activities under the Proposed Action and alternatives. Please refer to Appendix D for a detailed discussion of the data and modeling techniques used to quantify emissions from dredging operations. The emissions calculations are also provided in Appendix D.

4.14.2.2 Generation of Construction Emissions

Emissions generated by construction activities include fugitive dust from site grading, and criteria pollutant and GHG exhaust emissions from construction equipment. These emissions would be temporary and would cease when construction activities are complete. Two new facilities, Waldron (the sand plant proposed by The Master's Dredging Company) and Washington (the sand plant proposed by Edward N. Rau Contractor Company), would be constructed under the Proposed Action, Alternative A, Alternative B, and Alternative C; however, limited information is available on when and how each site would be built. Emissions from construction activities were estimated using conservative assumptions to ensure that emissions were not under-represented. Please refer to Appendix D for an expanded discussion of the assumptions and techniques used in the emissions modeling.

Neither the MDNR nor the St. Louis Air Pollution Control Program has established construction emissions thresholds. Consequently, potential adverse impacts on air quality resulting from construction were evaluated by comparing the estimated emissions to the federal *de minimis* thresholds.

4.14.2.3 Conformity Analysis

As discussed in Section 3.16.6.1, the following counties in the Project area are classified as federal nonattainment areas for the 8-hour ozone standard and therefore are subject to conformity requirements: Franklin, Madison, St. Charles, and St. Louis. These counties are located in the St. Charles segment.

The calculation of emissions for dredging, materials-handling, and hauling sand and gravel for companies operating in the St. Charles segment (see Appendix D) were assigned to each nonattainment county using the locations of the onshore facilities (see Figure 2.2.-1). This step is necessary to ensure that emissions produced in each county are not under- or over-represented. The following sections provide additional detail on the methods used to apportion emissions generated for each activity of dredging operations.

Dredging

Because the operating locations of individual dredges and tugs within a specified segment are unknown, emissions generated by dredging activities were assumed to occur in counties with sand and gravel facilities. For example, because Capital Sand Company owns only one facility in the St. Charles segment (located in Franklin County), 100 percent of the dredging emissions calculated for Capital

Sand Company were assumed to occur in Franklin County. For companies operating in more than one county, the ratio of storage capacities among facilities was used to apportion emissions to individual counties.

Materials-Handling Equipment

Emissions from materials-handling equipment were assumed to occur at each onshore facility owned by the companies. For example, four facilities are located in St. Louis County. Emissions from materials-handling equipment in St. Louis County therefore were assumed to represent the sum total of emissions generated by equipment operating at each of these facilities.

Transportation of Sand and Gravel

Emissions from transporting sand and gravel were assumed to occur in the county from which the haul truck would originate. In other words, emissions generated by truck trips hauling sand and gravel from the four facilities in St. Louis County were included in the emissions inventory for St. Louis County. As discussed in Section 3.12, the market area served by each sand plant was assumed to be within a 25-mile radius of the facility. Therefore, it is likely that some of the trucks would travel outside the county from which they originated, depending on the facility location. Assuming that the total emissions generated by haul truck trips would occur within a single county is conservative and ensures that emissions are not under-represented.

Emissions from dredging, materials-handling equipment, and transportation of sand and gravel in each of the nonattainment counties were summed to obtain total emissions for the Proposed Action and alternatives. The difference in emissions relative to existing conditions, which represents the total emissions associated with implementation of the Proposed Action and alternatives, then was compared to the federal *de minimis* thresholds to determine conformity with federal regulations.

4.14.2.4 Increased Health Risks from Exposure of Sensitive Receptors to Diesel Particulate Matter

Increased health risks can result from prolonged exposure to elevated DPM concentrations. DPM emissions were calculated for the Proposed Action and alternatives (see Appendix D). However, a quantitative analysis of health risks is not appropriate for this document because the emissions quantified for this analysis are mass emissions that would be generated by sand and gravel operations, not the resulting DPM concentration that is the metric required for a health risk assessment (HRA).

A number of site-specific factors are required to calculate DPM concentrations caused by increased dredging operations. For example, the schedule and location of operating equipment, as well as meteorological conditions, are necessary to model pollutant dispersion and calculate relative concentrations downwind of the source of DPM. In addition, information on the location of specific receptors is required to perform an HRA. Because the site-specific information is unavailable, this analysis qualitatively evaluates the potential for adverse exposure to DPM based on the permit length and the proximity of sensitive receptors to onshore facilities (existing and proposed for construction).

The USEPA has issued basic guidance for the assessment of carcinogen health risks (USEPA 2005). A more robust and prescriptive guidance document also has been prepared by the Office of Environmental Health Hazard Assessment (OEHHA), which is part of the California State Department. Both documents stress that cancer health risks typically are associated with chronic exposures to carcinogenic substances. The USEPA states that an exposure period of 20 years or longer often is assumed for cancer development, while the OEHHA recommends using a 70-year exposure period for the cancer risk analysis (USEPA 2005, CARB 2000). In addition, both documents discuss the need to consider distance relationships between the source and potential receptor. Specifically, the OEHHA indicates that DPM concentrations decrease as a function of distance. In other words, the farther a receptor is from the source of DPM, the less severe the potential health risks. Based on professional practices, a radius of 1,000 feet therefore was used to identify receptors that may be adversely affected by increases in DPM.

4.14.2.5 Generation of Greenhouse Gas Emissions

GHGs from sand and gravel operations are primarily the result of fuel use by dredges, tugs, materials-handling equipment, and haul vehicles. In addition, the use of heavy-duty equipment during construction activities produces GHG emissions as engine exhaust. Emissions from these activities were quantified based on information summarized in Appendix D.

To date, specific thresholds to evaluate adverse impacts pertaining to GHG emissions have not been established by local decision-making agencies, the state, or the federal government. As discussed in Section 3.16-7.2, the CEQ has published Draft Guidance for the consideration of climate change impacts in NEPA analyses (Sutley 2010). The Draft Guidance suggests that the impacts of projects directly emitting GHGs in excess of 25,000 tons annually be considered in a qualitative and quantitative manner. However, the guidance stresses that, given the nature of GHGs and their persistence in the atmosphere, climate change impacts should be considered on a cumulative level. For consistency, this section presents a project-level analysis of GHG emissions. Please refer to Chapter 5, "Cumulative

Impacts,” for a discussion of the cumulative GHG impacts expected under the Proposed Action and alternatives.

4.14.2.6 Generation of Emissions from Alternate Source Locations

Implementation of the No Action Alternative, Alternative A, and Alternative B would result in reduced commercial sand and gravel dredging on the LOMR. It is anticipated that, if dredging volumes are reduced, floodplain open-pit mining adjacent to the Missouri River likely would develop over the long term to meet regional demand for sand and gravel. However, because of the extended start-up period for new mines, replacement supplies over the next few years likely would come from existing sources located on the Kansas and Mississippi Rivers or from existing open-pit and instream mining operations in Missouri, Illinois, and Kansas (see Figure 2.3-2). A small portion of materials also may come from manufactured sand. Because it is not known when or where alternate sources would operate, potential air quality and climate impacts from these sources cannot be quantified and are discussed qualitatively.

4.14.2.7 Generation of Emissions from Sand Plant Operations

Sand plants can generate fugitive dust from processed materials and air pollutants from the upkeep of offices and employee commute trips. Under the Proposed Action and alternatives, emissions from operation of these sources are expected to negligibly affect air quality or climate change. Consequently, these emissions were excluded from the impact analysis. Please refer to Appendix D for additional detail.

4.14.3 Proposed Action

4.14.3.1 Construction Emissions That Exceed Thresholds

St. Joseph, Waverly, and Jefferson City Segments

Under the Proposed Action, no new onshore facilities or dredging-related construction is expected to occur in the St. Joseph, Waverly, or Jefferson City segment. Consequently, no emissions would be generated from construction of sand plants, and no impact would occur.

Kansas City Segment

Under the Proposed Action, The Master’s Dredging Company would construct a new sand plant (Master’s–Waldron) in Platte County, Missouri. Emissions associated with construction of this facility were quantified based on information summarized in Appendix D. Based on information provided by

the permit applicant and aerial images of existing sand and gravel facilities, it was assumed that the facility site would encompass 60 acres and contain one 1,000–square-foot general garage-type structure. The results of the air quality modeling are summarized in Table 4.14-1 and compared to the federal *de minimis* thresholds. The construction emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-1, emissions from construction of the Waldron sand plant would not exceed the federal *de minimis* thresholds and therefore would not represent an adverse air quality impact.

Table 4.14-1 Summary of Criteria Pollutant and Greenhouse Gas Emissions from Construction of The Master’s Dredging Company Sand Plant at Waldron (tons/year)

	VOC	NO _x	CO	PM ₁₀			PM _{2.5}			CO ₂ e (GHG) ^a
				Total	Exhaust	Dust	Total	Exhaust	Dust	
Construction emissions				17.84	2.99	16.35	4.78	2.75	3.41	5,704
Threshold	100	100	100	100	N/A ^b	N/A ^b	100	N/A ^b	N/A ^b	N/A ^b
Adverse effect?	No	No	No	No	N/A	N/A	No	N/A	N/A	N/A

Notes:

- N/A = Not applicable.
- VOC = Volatile organic compounds.
- NO_x = Nitrogen dioxide.
- CO = Carbon monoxide.
- GHG = Greenhouse gas.
- PM₁₀ = Particulate matter less than 10 microns.
- PM_{2.5} = Particulate matter less than 2.5 microns.
- CO₂e = Carbon dioxide equivalent, or total GHG emissions.

^a Presented in metric tons. Emissions are discussed further in Section 4.14.3.4.

^b Not applicable because there is no *de minimis* threshold for particulate matter exhaust, dust, or GHG emissions.

Source: Appendix D.

St. Charles Segment

Under the Proposed Action, Edward N. Rau Contractor Company would construct a new sand plant (Rau–Washington) in Franklin County, Missouri. Emissions associated with construction of this facility were quantified based on information summarized in Appendix D. Based on information provided by the permit applicant and aerial images of existing sand and gravel facilities, it was assumed that the facility site would encompass 25.6 acres and contain one 1,000–square foot general garage-type structure. The results of the air quality modeling are summarized in Table 4.14-2 and compared to the federal *de minimis* thresholds. These emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-2, emissions from construction of the Washington

sand plant would not exceed the federal *de minimis* thresholds and therefore would not represent an adverse air quality impact.

Table 4.14-2 Summary of Criteria Pollutant and Greenhouse Gas Emissions from Construction of the Edward N. Rau Contractor Company Proposed Sand Plant at Washington (tons/year)

	VOC	NO _x	CO	PM ₁₀			PM _{2.5}			CO ₂ e (GHG) ^a
				Total	Exhaust	Dust	Total	Exhaust	Dust	
Construction emissions	1.56	18.03	7.14	6.77	1.49	3.78	3.54	1.37	0.79	2,726
Threshold	100	100	100	100	N/A ^b	N/A ^b	100	N/A ^b	N/A ^b	N/A ^b
Adverse effect?	No	No	No	No	N/A	N/A	No	N/A	N/A	N/A

Notes:

- N/A = Not applicable.
- VOC = Volatile organic compounds.
- NO_x = Nitrogen dioxide.
- CO = Carbon monoxide.
- GHG = Greenhouse gas.
- PM₁₀ = Particulate matter less than 10 microns.
- PM_{2.5} = Particulate matter less than 2.5 microns.
- CO₂e = Carbon dioxide equivalent, or total GHG emissions.

^a Presented in metric tons. Emissions are discussed further in Section 4.14.3.4.

^b Not applicable because there is no *de minimis* threshold for particulate matter exhaust, dust, or GHG emissions.

Alternate Sources

Alternate sources of sand and gravel would not be required under the Proposed Action. Therefore, no new construction is expected at alternate source locations, and no related construction emissions that could potentially exceed thresholds would occur.

4.14.3.2 Operations Emissions That Exceed Thresholds

St. Joseph, Kansas City, Waverly, and Jefferson City Segments

As discussed in Section 3.16, the St. Joseph, Kansas City, Waverly, and Jefferson City segments are located in counties classified as attainment areas with regard to the NAAQS. Consequently, conformity analyses were not required for these four segments.

St. Charles Segment

As discussed in Section 3.16, the St. Charles segment is located in counties classified as nonattainment areas with regard to the NAAQS. Consequently, a conformity analysis is required for the St. Charles segment. Total emissions generated by the Proposed Action in counties adjacent to the St. Charles segment (Franklin, Madison, St. Charles, and St. Louis Counties) are presented in Table 4.14-3. The difference in emissions relative to existing conditions, or the incremental increase in emissions associated with the Proposed Action, is compared to the federal *de minimis* thresholds.

Table 4.14-3 Conformity Analysis for the Proposed Action (tons/year)^a

Counties Classified as Nonattainment	VOC	NO _x
Franklin County		
Emissions – Proposed Action ^{b,c}	6.11	96.22
Emissions – existing conditions	0.72	9.50
Proposed Action minus existing conditions ^d	+5.40	+86.72
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	609	1,465
Adverse effect?	No	No
Madison County		
Emissions – Proposed Action ^b	2.12	33.55
Emissions – existing conditions	0.84	13.13
Madison County (continued)		
Proposed Action minus existing conditions ^d	+1.28	+20.41
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	1,647	2,196
Adverse effect?	No	No
St. Charles County		
Emissions – Proposed Action ^b	5.26	100.66
Emissions – existing conditions	1.89	36.66
Proposed Action minus existing conditions ^d	+3.38	+64.00
Federal <i>de minimis</i> threshold	100	100

Table 4.14-3 Conformity Analysis for the Proposed Action (tons/year)^a

Counties Classified as Nonattainment	VOC	NO _x
St. Charles County (continued)		
Regional significance threshold (10% of regional emissions inventory)	1,365	2,804
Adverse effect?	No	No
St. Louis County		
Emissions – Proposed Action ^b	12.48	240.32
Emissions – existing conditions	5.12	95.90
Proposed Action minus existing conditions ^d	+7.36	+144.42
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	6,012	6,486
Adverse effect?	No	Yes

Notes:

VOC = Volatile organic compounds.
NO_x = Oxides of nitrogen.

- ^a Operations of sand plants may generate additional emissions of NO_x and VOC. However, any emissions were assumed to be negligible and would not affect the conformity determination.
- ^b Represents sum total of emissions generated from dredging, materials-handling, and hauling sand and gravel.
- ^c Because construction of an Edward N. Rau Contractor Company sand plant would occur concurrently with dredging activities, emissions generated from construction have been included in the total. Note that these emissions would occur only during 1 year of the 5-year permit period.
- ^d Values may not match as a result of rounding.

Source: Appendix D.

As shown in Table 4.14-3, implementation of the Proposed Action would exceed the federal *de minimis* threshold of 100 tons/year of NO_x in St. Louis County. Because implementation of the Proposed Action would exceed the federal *de minimis* threshold for NO_x in St. Louis County, a general conformity determination was performed to demonstrate that total direct and indirect emissions of NO_x would conform to the SIP for ozone.

An inventory of regional ozone levels are provided in the SIP, and are used to benchmark the region's progress toward attainment of the NAAQS. Thus, regulations and emissions reduction commitments, which are based on an area's level of nonattainment, are continually evaluated against emissions inventories included in updated air quality plans. The conformity determination was therefore made by reviewing the emissions sources included in the inventory for the current SIP, and comparing these

sources to the equipment that would be operated under the Proposed Action. If dredgers, tug boats, materials-handling equipment, and haul trucks are included in the current SIP, it can be inferred that any emissions generated by the Proposed Action will be included and appropriately analyzed in future attainment plans.

Table 4.14-4 outlines the SIP categories for which emissions generated by equipment operated under the Proposed Action would be included in future emissions inventories. This information was obtained from the *2002 Base Year Emissions Inventory for the Missouri Portion of the St. Louis 8-Hour Ozone Nonattainment Area* (MDNR 2007) and verified by the MDNR staff (Basham pers. comm.). Because equipment operated under the Proposed Action would be included in future inventories for the St. Louis area, regulations and environmental commitments developed by the MDNR to achieve attainment with the NAAQS would account for emissions generated by the Proposed Action. Consequently, the Proposed Action would not obstruct or conflict with the SIP.

Table 4.14-4 State Implementation Plan Emissions Categories

Equipment Operated under the Proposed Action	Corresponding State Implementation Plan Emissions Category
Diesel-powered materials-handling equipment	Non-road diesel – construction
Diesel-powered tug boats	Marine vessels – diesel
Diesel-powered dredgers	Marine vessels – diesel
Diesel-powered haul trucks	On-road mobile

Sources: MDNR 2007, Basham pers. comm.

Alternate Sources

Alternate sources of sand and gravel would not be required under the Proposed Action. Therefore, increased dredging and processing are not expected at alternate source locations, and no related operations emissions that could potentially exceed thresholds would occur.

4.14.3.3 Increased Health Risks from Exposure of Sensitive Receptors to Diesel Particulate Matter

St. Joseph Segment

In the St. Joseph segment, Holliday Sand & Gravel Company would operate the St. Joseph sand plant. This facility is located in an area that has been dredged historically; however, Table 4.14-5 indicates

that implementation of the Proposed Action would generate 9.31 additional tons/year of DPM relative to existing conditions. This increased production could result in elevated pollutant concentrations near the sources of DPM. As discussed above, limited information on site-specific conditions prevents determination of the exact concentrations.

As shown in Table 3.13-6, sensitive receptors are located within 1,000 feet of the St. Joseph facility operated by Holliday Sand & Gravel Company. Individuals at these sensitive receptors may be exposed to elevated health risks from dredging operations. In addition, dredging could expand to new areas in order to accommodate the increased amount of material permitted in this segment. Sensitive receptors in these areas that are not currently exposed to dredging activities could potentially be exposed to new DPM emissions from dredges and tugboats.

Although DPM concentrations are expected to increase under the Proposed Action, dredging would be permitted for only 5 years. If activities would continue beyond this period, a subsequent environmental analysis would need to be conducted. As previously discussed, cancer health risks typically are associated with long-term exposures on the order of 20–70 years (USEPA 2005, CARB 2000). Any exposure to increased concentrations of DPM therefore would be well below the recommended analysis duration for cancer risk assessments. In addition, elevated DPM concentrations generated by dredging equipment would dissipate as a function of distance and therefore would be even lower at the closest residence, which is 850 feet from the St. Joseph facility, than at the point of origin.

Kansas City Segment

In the Kansas City segment, Holliday Sand & Gravel Company would operate the Riverside and Randolph sand plants, and The Master's Dredging Company would operate the proposed Waldron sand plant. Although these facilities are located in an area that has been dredged historically, Table 4.14-5 indicates that implementation of the Proposed Action would generate 7.08 additional tons/year of DPM relative to existing conditions. This increased production could result in elevated pollutant concentrations near the sources of DPM. As discussed above, limited information on site-specific conditions prevents determination of the exact concentrations.

Although DPM likely would increase with implementation of the Proposed Action, Table 3.13-6 indicates that no sensitive receptors are within 1,000 feet of either facility. Consequently, there is no potential for sensitive receptors nearest the sand plants to be exposed to elevated health risks from dredging operations.

It is likely that dredging may expand to new areas in the segment in order to accommodate the increased amount of permitted material. This expansion may expose new sensitive receptors to DPM from dredges and tugs. As discussed above, any exposure would be temporary and well below the recommended duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). Moreover, DPM concentrations generated by dredging equipment would dissipate as a function of distance and therefore would be minimal at the nearest residence.

Table 4.14-5 Summary of Diesel Particulate Matter Emissions from Dredging in the Lower Missouri River under the Proposed Action and Alternatives (tons/year)

	Segment				
	St. Joseph	Kansas City	Waverly	Jefferson City	St. Charles
Proposed Action					
Emissions – Proposed Action	11.78	22.22	4.80	15.23	48.32
Emissions – existing conditions	2.47	15.15	3.29	9.19	16.90
Proposed Action minus existing conditions	+9.31	+7.08	+1.51	+6.04	+16.86
No Action Alternative					
Emissions – No Action Alternative	0.00	0.00	0.00	0.00	0.00
Emissions – existing conditions	2.47	15.15	3.29	9.19	16.90
No Action Alternative minus existing conditions	-2.47	-15.15	-3.29	-9.19	-16.90
Alternative A					
Emissions – Alternative A	4.70	2.71	3.79	2.27	4.10
Emissions – existing conditions	2.47	15.15	3.29	9.19	16.90
Alternative A minus existing conditions	+2.23	-12.43	+0.51	-6.92	-12.80
Alternative B					
Emissions – Alternative B	11.95	6.13	8.57	5.17	9.24
Emissions – existing conditions	2.47	15.15	3.29	9.19	16.90
Alternative B minus existing conditions	+9.48	-9.02	+5.29	-4.02	-7.66
Alternative C					
Emissions – Alternative C	2.24	16.10	3.46	9.02	18.48
Emissions – existing conditions	2.47	15.15	3.29	9.19	16.90
Alternative C minus existing conditions	-0.23	+0.96	+0.17	-0.17	+1.58

Waverly Segment

In the Waverly segment, Capital Sand Company would operate the Lexington and Carrollton sand plants. Although these facilities are located in areas that have been dredged historically, Table 4.14-5 indicates that implementation of the Proposed Action would generate 1.51 additional tons/year of DPM relative to existing conditions. Because this increase is negligible compared to existing emissions, it is unlikely that DPM concentrations would increase substantially. Consequently, there is no potential for sensitive receptors nearest onshore facilities to be exposed to elevated health risks from dredging operations in the segment.

New sensitive receptors may be exposed to DPM from dredges and tugs operating in locations that have not previously been dredged. As discussed above, any exposure of these receptors or those nearest the Carrollton facility would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). Moreover, DPM concentrations generated by dredging operations would dissipate as a function of distance and would be relatively low at the nearest sensitive receptors.

Jefferson City Segment

In the Jefferson City segment, Capital Sand Company and Hermann Sand & Gravel would operate the Jefferson City, Rocheport, Boonville, and Glasgow sand plants. Although these facilities are located in areas that have been dredged historically, Table 4.14-5 indicates that implementation of the Proposed Action would generate 6.04 additional tons/year of DPM relative to existing conditions. This increased production could result in elevated pollutant concentrations near the sources of DPM, although the exact concentration is unknown.

As shown in Table 3.13-6, sensitive receptors are located within 1,000 feet of the Glasgow sand plant. These individuals may be exposed to elevated health risks from dredging operations. In addition, new sensitive receptors may be exposed to DPM from dredges and tugs operating in locations that have not been dredged previously. As discussed above, any exposure of these receptors or those nearest the Glasgow sand plant would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). Moreover, DPM concentrations generated by dredging operations would dissipate as a function of distance and would be relatively low at the nearest residence, which is 600 feet from the Glasgow facility.

St. Charles Segment

In the St. Charles segment, Capital Sand Company, Limited Leasing Company, Edward N. Rau Contractor Company, J.T.R., and Hermann Sand & Gravel would operate the Washington, Fort Belle, Bridgeton, Alton, Chesterfield, Washington (Rau), St. Charles, Riverview, and Hermann sand plants. Although these facilities are located in areas that have been dredged historically, Table 4.14-5 indicates that implementation of the Proposed Action would generate 16.86 additional tons/year of DPM relative to existing conditions. This increased production likely would result in elevated pollutant concentrations near the sources of DPM, although the exact concentration is unknown.

As shown in Table 3.13-6, sensitive receptors are located within 1,000 feet of the Washington, St. Charles, Alton, and Fort Belle sand plants. These individuals may be exposed to elevated health risks from dredging operations. In addition, new sensitive receptors may be exposed to DPM from dredges and tugs operating in locations that had not been dredged previously. As discussed above, any exposure of these receptors or those nearest the Washington, St. Charles, Alton, and Fort Belle sand plants would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). Moreover, DPM concentrations generated by dredging operations would dissipate as a function of distance and would be relatively low at the nearest residence, which is 370 feet from the Washington (Rau) facility.

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, DPM would not increase at alternate source locations and no related increased health risks would occur at sensitive receptors from exposure to DPMs.

4.14.3.4 Greenhouse Gas Emissions Resulting in Global Climate Change

All Segments

As shown in Table 4.14-6, the majority of GHG emissions generated by the Proposed Action would occur in the St. Joseph and St. Charles segments. However, because GHGs accumulate in the atmosphere and affect climate change on a global scale, the Proposed Action is evaluated as a whole rather than on a segment-by-segment basis.

Total GHG emissions produced by dredging operations in the LOMR under the Proposed Action are estimated at 78,834 metric tons of CO₂e per year (Table 4.14-6). GHG emissions from construction

activities are expected to generate an additional 8,430 metric tons. Calculating construction emissions over the 5-year permit lifetime results in 80,520 metric tons of CO₂e per year under the Proposed Action—an increase of 47,616 metric tons over existing conditions. This is equivalent to adding approximately 31,744 typical passenger vehicles to the road (USEPA 2009).

Table 4.14-6 Summary of Greenhouse Gas Emissions from Dredging in the Lower Missouri River under the Proposed Action and Alternatives (metric tons/year CO₂e)

	Segment					Total
	St. Joseph	Kansas City	Waverly	Jefferson City	St. Charles	
Proposed Action						
Emissions – Proposed Action	9,423	14,721	3,686	10,619	40,385	78,834
Emissions – existing conditions	1,624	8,297	2,450	6,493	14,039	32,904
Proposed Action minus existing conditions	+7,799	+6,423	+1,236	+4,126	+26,345	+45,930
No-Action Alternative						
Emissions – No Action Alternative	0	0	0	0	0	0
Emissions – existing conditions	1,624	8,297	2,450	6,493	14,039	32,904
No Action Alternative minus existing conditions	-1,624	-8,297	-2,450	-6,493	-14,039	-32,904
Alternative A						
Emissions – Alternative A	3,864	1,607	3,219	1,573	3,298	13,560
Emissions – existing conditions	1,624	8,297	2,450	6,493	14,039	32,904
Alternative A minus existing conditions	+2,239	-6,691	+769	-4,920	-10,741	-19,344
Alternative B						
Emissions – Alternative B	9,843	3,615	7,277	3,586	7,405	31,726
Emissions – existing conditions	1,624	8,297	2,450	6,493	14,039	32,904
Alternative B minus existing conditions	+8,219	-4,682	+4,827	-2,907	-6,635	-1,178
Alternative C						
Emissions – Alternative C	1,693	10,946	2,724	6,358	14,821	36,542
Emissions – existing conditions	1,624	8,297	2,450	6,493	14,039	32,904
Alternative C minus existing conditions	+69	+2,648	+274	-134	+781	+3,638

Notes:

CO₂e = Carbon dioxide equivalent.

GHG emissions from construction activities are expected to generate 8,430 metric tons of emissions separate from GHG emissions shown in this table.

Presented in metric tons.

As previously noted, GHG emissions tend to accumulate in the atmosphere because of their relatively long lifespan. Consequently, their impact on climate change is mostly independent of the point of emission. In other words, GHG emissions are more appropriately evaluated on a regional, state, or even national scale than at an individual project level. Further, it is unlikely that the GHGs emitted under the Proposed Action would cause an individually discernible impact on global climate change.

Alternate Sources

Alternate sources would not be required under the Proposed Action. Therefore, no contributions to GHG emissions would occur.

4.14.4 No Action Alternative

4.14.4.1 Construction Emissions That Exceed Thresholds

All Segments

Because no new dredging-related construction would occur in any segment under the No Action Alternative, no emissions from new dredging-related construction would occur.

Alternate Sources

As discussed in Section 4.14.2.6, limited information is available on the locations and types of dredging or mining that would replace sand and gravel supplies obtained from the LOMR. The basis for the following qualitative analysis is assumptions about existing dredging and mining locations and operations that could replace the current demand supplied through dredging in the LOMR.

As discussed in Chapter 2, the capacity of alternate sources in the market area are expected to be sufficient in the short term to replace the sand and gravel currently provided through dredging in the LOMR. However, the available capacity of alternate sources is dependent on several factors that are difficult to estimate. Although it is unlikely that new mining operations would be constructed in the near future, the variability of market supply and demand and the status of existing alternate sources may result in an immediate need for additional or expanded mining facilities. In addition, preparation for development of new, long-term alternate sources may result in minor amounts of construction and site preparation activities within the next 5 years.

If new sand and gravel facilities are constructed or expanded as a result of the No Action Alternative, it is likely that emissions would be similar to those presented in Tables 4.14-1 and 4.14-2, per facility. These emissions would be temporary and would cease when construction activities are completed. As shown in Tables 4.14-1 and 4.14-2, emissions generated by construction of one facility would be below the federal *de minimis* thresholds. However, if multiple facilities, or facilities larger than those analyzed in Tables 4.15-1 and 4.14-2, were constructed simultaneously within the same region, emissions could exceed the *de minimis* thresholds. In the absence of specific information on the number and locations of facilities to be constructed, this impact is considered potentially adverse.

4.14.4.2 Operations Emissions That Exceed Thresholds

All Segments

Under the No Action Alternative, commercial dredging in the LOMR would cease, and no dredging-related emissions would be generated. Implementation of the No Action Alternative therefore would result in a 100 percent decrease in dredging-related emissions on the LOMR compared to existing conditions. As such, the No Action Alternative would improve air quality in all river segments.

Alternate Sources

As shown in Figure 2.9-1, multiple locations for alternate sources of sand and gravel have been identified throughout Illinois, Kansas, and Missouri. In these states, several counties are classified as federal nonattainment and maintenance areas. Because replacement sand and gravel most likely would be obtained from sources closest to the existing demand centers along the LOMR, a 25-mile radius was used to identify nonattainment counties most likely to experience increased production from alternate sources. These counties and their nonattainment status are:

- Illinois
 - Ozone nonattainment: Jersey, Madison, Monroe, and St. Clair Counties; and
 - PM₁₀ maintenance: the portion of Madison County near Granite City.

- Missouri
 - Ozone nonattainment: Franklin, Jefferson, St. Charles, and St. Louis Counties; and
 - CO maintenance: the portion of St. Louis County between I-270 and the Mississippi River.

To the extent that sand and gravel production shifts to locations in these counties, increased dredging activities may contribute to existing violations of the NAAQS. In the absence of specific information on the number and locations of facilities to be constructed, this impact is considered potentially adverse.

4.14.4.3 Increased Health Risks from Exposure of Sensitive Receptors to Diesel Particulate Matter

All Segments

No new dredging-related construction or commercial dredging operations would occur in any segment. Therefore, DPM in the atmosphere would decrease, and air quality would improve.

Alternate Sources

If sand and gravel operations at alternate source locations increase to meet local demand, emissions of DPM also would increase. The increased production likely would elevate DPM concentrations in the immediate area of operations. Sensitive receptors within 1,000 feet of these sources may be exposed to elevated health risks from sand and gravel operations. While many alternate sources may experience increased dredging or mining only until new long-term operations could be developed, some locations could experience long-term increases in production. Without detailed information on the locations of new and existing alternate sources, or on the location of sensitive receptors and the length of dredging operations, it is difficult to determine whether DPM concentrations would result in adverse health effects.

4.14.4.4 Greenhouse Gas Emissions Resulting in Global Climate Change

All Segments

No new dredging-related construction or commercial dredging operations would occur in any segment. Therefore, no contributions to GHG emissions in the atmosphere would occur.

Alternate Sources

The amount of GHG emissions generated by shifting sand and gravel production to alternate sources is largely dependent on the type of equipment that would be used to dredge or mine the material. As discussed in Chapter 2, the equipment required for dredging along the Mississippi and Kansas Rivers is similar to the equipment currently used on the LOMR, except that dredged material is not transported via barges and tugs on the Kansas River. Assuming that other fleet characteristics (for example, engine type, year, and horsepower) are similar to those on the LOMR, dredging emissions generated by shifting production to the Mississippi and Kansas Rivers likely would be less than emissions generated by existing equipment on the LOMR because no tugs would be used on the Kansas River. However, if material extracted from the Mississippi and Kansas Rivers must be hauled farther than materials dredged from the LOMR, total GHG emissions generated by these sources under the No Action Alternative may be greater than emissions produced under existing conditions.

Open-pit and instream mining operations typically do not involve the use of tugboats. Consequently, shifting production to land-based sources may result in a reduction in GHG emissions generated by dredging equipment relative to existing conditions. However, it is difficult to determine whether total emissions produced by these sources would be lower than emissions produced under existing conditions. As shown in Appendix D, tugboats are a more polluting transport on a pound-per-pound basis than haul trucks. If shipping distances do not change as a result of shifting production, GHG emissions would be lower from alternate sources. If shipping distances increase, GHG emissions produced by hauling sand and gravel would be higher. An increase in shipping distance may negate any reduction in GHG emissions achieved from not operating tugboats.

Based on the analysis above, GHG emissions produced under the No Action Alternative would likely be similar to emissions generated under existing conditions but may be slightly higher or lower depending on the type of alternate source and the changes in shipping patterns. If GHG emissions increase under the No Action Alternative as a result of additional shipping distances, the emissions most likely would be minor and would not cause an individually discernible impact on global climate change. This impact is not considered adverse.

4.14.5 Alternative A

Although Alternative A would increase current dredging operations in the St. Joseph segment and decrease operations in all other segments, total dredging for the combined segments would be reduced. Alternate sources would be required to meet the demand of local communities. The air

quality and climate change impacts of the alternate sources under Alternative A would be similar to those described for the No Action Alternative. Potential impacts related to alternate sources would be less under Alternative A, however, because less material would be needed from alternate sources.

4.14.5.1 Construction Emissions That Exceed Thresholds

St. Joseph, Waverly, and Jefferson City Segments

No new onshore facilities or dredging-related construction is expected to occur in the St. Joseph, Waverly, or Jefferson City segment; consequently, no construction emissions would occur.

Kansas City Segment

Under Alternative A, The Master's Dredging Company likely would construct a new sand plant (Master's–Waldron) in Platte County. Emissions generated by construction activities would be similar to those presented in Table 4.14-1. These emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-1, construction of the Waldron sand plant would not exceed the federal *de minimis* thresholds. This impact is not considered adverse.

St. Charles Segment

Under Alternative A, the Edward N. Rau Contractor Company likely would construct a new sand plant (Rau–Washington) in Franklin County. Emissions generated by construction would be similar to those presented in Table 4.14-2. These emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-2, construction of the Washington sand plant would not exceed the federal *de minimis* thresholds. This impact is not considered adverse.

Alternate Sources

To the extent that Alternative A results in construction of new or expanded facilities, potential emissions would be similar to those presented in Tables 4.14-1 and 4.14-2. If multiple facilities, or facilities larger than those analyzed in Tables 4-15.1 and 4.14-2, are constructed simultaneously within the same region, emissions could exceed the *de minimis* thresholds. In the absence of specific information on the number and locations of facilities to be constructed, this impact is considered potentially adverse.

4.14.5.2 Operations Emissions That Exceed Thresholds

St. Joseph, Kansas City, Waverly, and Jefferson City Segments

As previously noted, the St. Charles segment is the only segment in the Project area with counties classified as nonattainment areas with regard to the NAAQS. Consequently, a conformity analysis is required only for the St. Charles segment.

St. Charles Segment

Total emissions generated by dredging in the LOMR under Alternative A in Franklin, Madison, St. Charles, and St. Louis Counties are presented in Table 4.14-7. The difference in emissions from existing conditions is compared to the federal *de minimis* thresholds. As shown in Table 4.14-7, implementation of Alternative A would not exceed *de minimis* thresholds.

Alternate Sources

Alternative A would result in an increase in dredging and processing at alternate source locations at existing facilities in the short term and (potentially) at new facilities in the long term. As shown in Figure 2.9-1, multiple locations for alternate sources of sand and gravel have been identified throughout Illinois, Kansas, and Missouri. In these states, several counties are classified as federal nonattainment and maintenance areas. Because replacement sand and gravel most likely would be obtained from sources closest to the existing demand centers along the LOMR, a 25-mile radius was used to identify nonattainment counties most likely to experience increased production from alternate sources.

Table 4.14-7 Conformity Analysis for Alternative A^a (tons/year)

Counties Classified as Nonattainment	VOC	NO _x
Franklin County		
Emissions – Alternative A ^{b,c}	1.85	22.38
Emissions – existing conditions	0.72	9.50
Alternative A minus existing conditions ^d	+1.13	+12.88
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	609	1,465
Adverse effect?	No	No
Madison County		
Emissions – Alternative A ^b	0.18	2.84
Emissions – existing conditions	0.84	13.13

Table 4.14-7 Conformity Analysis for Alternative A^a (tons/year)		
Alternative A minus existing conditions ^d	-0.66	-10.30
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	1,647	2,196
Adverse effect?	No	No
St. Charles County		
Emissions – Alternative A ^b	0.45	8.57
Emissions – existing conditions	1.89	36.66
Alternative A minus existing conditions ^d	-1.44	-28.09
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	1,365	2,804
Adverse effect?	No	No
St. Louis County		
Emissions – Alternative A ^b	1.06	20.36
Emissions – existing conditions	5.12	95.90
Alternative A minus existing conditions ^d	-4.06	-75.54
St. Louis County (continued)		
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	6,012	6,486
Adverse effect?	No	No

Notes:

VOC = Volatile organic compounds.

NO_x = Nitrogen dioxide.

^a Operations of sand plants may generate additional emissions of NO_x and VOC. However, any emissions were assumed to be negligible and would not affect the conformity determination.

^b Represents sum total of emissions generated from dredging, materials-handling, and hauling sand and gravel.

^c Because construction of an Edward N. Rau Contractor Company sand plant would occur concurrently with dredging activities, emissions generated from construction have been included in the total. Note that these emissions would occur only during 1 year of the 5-year permit period.

^d Values may not match as a result of rounding.

Source: Appendix D.

To the extent that sand and gravel production shifts to locations in these counties, increased dredging activities may contribute to existing violations of the NAAQS. In the absence of specific information on the number and locations of facilities to be constructed, this impact is considered potentially adverse.

4.14.5.3 Increased Health Risks from Exposure of Sensitive Receptors to Diesel Particulate Matter

St. Joseph Segment

Table 4.14-5 indicates that implementation of Alternative A would generate 2.23 additional tons/year of DPM relative to existing conditions in the St. Joseph segment. This increased production likely would result in elevated pollutant concentrations near the sources of DPM. As discussed above, limited information on site-specific conditions prevents determination of the exact concentrations.

Under Alternative A, it is likely that dredging may expand to new areas to accommodate the increased amount of material permitted in this segment. Sensitive receptors in these areas that currently are not exposed to dredging activities could be exposed to DPM from dredges and tugboats.

Although DPM concentrations in the St. Joseph segment are expected to increase under Alternative A, dredging activities would be permitted for only 5 years. If activities would continue beyond this period, a subsequent environmental analysis would need to be conducted. Any exposure to increased concentrations of DPM would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). In addition, elevated DPM concentrations generated by dredging equipment would dissipate as a function of distance and therefore would be even lower at the closest sensitive land uses.

Consequently, Alternative A is not anticipated to expose sensitive receptors to elevated health risks in the Waverly segment.

Kansas City Segment

Table 4.14-5 indicates that implementation of Alternative A would generate 12.43 fewer tons/year of DPM relative to existing conditions in the Kansas City segment. It therefore is logical to assume that DPM concentrations in the Kansas City segment would be reduced. This is an air quality benefit. Because permitted volumes are constrained in the Kansas City segment under Alternative A, it is not likely that dredging activities would expand to new locations. Consequently, Alternative A is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the Kansas City segment. This impact is not considered adverse.

Waverly Segment

Table 4.14-5 indicates that implementation of Alternative A would generate 0.51 additional tons/year of DPM relative to existing conditions in the Waverly segment. Because this increase is negligible compared to existing emissions, it is unlikely that DPM concentrations would increase substantially. Consequently, there is no potential for sensitive receptors nearest the Lexington and Carrollton facilities to be exposed to elevated health risks from dredging operations.

Under Alternative A, dredging may expand to new areas to accommodate the increased amount of material permitted in this segment. Sensitive receptors in these areas that are not currently exposed to dredging activities could be exposed to DPM from dredges and tugboats. However, any new exposure to DPM would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). In addition, elevated DPM concentrations generated by dredging equipment would dissipate as a function of distance and therefore would be even lower at the closest sensitive land uses. Consequently, Alternative A is not anticipated to expose sensitive receptors to elevated health risks in the Waverly segment. This impact is not considered adverse.

Jefferson City Segment

Table 4.14-5 indicates that implementation of Alternative A would generate 6.92 fewer tons/year of DPM relative to existing conditions in the Jefferson City segment. It therefore is logical to assume that DPM concentrations in the Jefferson City segment would be reduced. This is an air quality benefit. Because permitted volumes are constrained in the Jefferson City segment under Alternative A, it is not likely that dredging activities would expand to new locations. Consequently, Alternative A is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the Jefferson City segment. This impact is not considered adverse.

St. Charles Segment

Table 4.14-5 indicates that implementation of Alternative A would generate 12.80 fewer tons/year of DPM relative to existing conditions in the St. Charles segment. It therefore is logical to assume that DPM concentrations in the St. Charles segment would be reduced. This is an air quality benefit. Because permitted volumes are constrained in this segment under Alternative A, it is not likely that dredging activities would expand to new locations. Consequently, Alternative A is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the St. Charles segment. This impact is not considered adverse.

If sand and gravel operations at alternate source locations increase in order to meet local demand, emissions of DPM also would increase. This increased production would likely elevate DPM concentrations in the immediate dredging or mining area. Sensitive receptors within 1,000 feet of these sources therefore may be exposed to elevated health risks. While it is likely that many alternate sources would be dredged or mined only until new long-term operations could be developed, some locations could be mined or dredged permanently. Without detailed information on the location of new and existing alternate sources, or on the location of sensitive receptors and the length of dredging operations, it is difficult to determine whether DPM concentrations would result in adverse health effects. Consequently, this is considered a potentially adverse effect.

4.14.5.4 Greenhouse Gas Emissions Resulting in Global Climate Change

All Segments

As shown in Table 4.14-6, the majority of GHG emissions generated under Alternative A would occur in the St. Joseph, Waverly, and St. Charles segments. However, because GHGs accumulate in the atmosphere and affect climate change on a global scale, Alternative A must be evaluated on a Project level rather than on a segment-by-segment basis.

Total GHG emissions produced by dredging operations in the LOMR are estimated at 13,560 metric tons of CO₂e per year. GHG emissions from construction activities are expected to generate an additional 8,430 metric tons. Amortizing the construction emissions over the 5-year permit lifetime results in 15,246 metric tons of CO₂e per year under Alternative A. This is a reduction of approximately 17,658 metric tons/year relative to existing conditions.

Alternate Sources

Additional GHG emissions would be generated by increased production of sand and gravel from alternate sources. Assuming that GHG emissions generated by these sources would be similar to emissions produced on the LOMR on a per-ton basis, removal of 4.71 million tons of sand from alternate source locations would generate approximately 29,000 metric tons of CO₂e per year. When combined with emissions generated along the LOMR and compared to existing conditions, Alternative A is expected to result in an increase of 11,506 metric tons of GHGs per year. This is equivalent to adding approximately 7,671 typical passenger vehicles to the road (USEPA 2009).

Because GHG emissions tend to accumulate globally, it is unlikely that the GHGs emitted under Alternative A would cause an individually discernible impact on global climate change. This impact is not considered adverse.

4.14.6 Alternative B

Alternative B would increase current dredging operations in the St. Joseph and Waverly segments and would decrease operations in all other segments; the total volume of dredging for the combined segments would be reduced. Alternate sources therefore would be required to meet the local demand for sand and gravel. The air quality and climate change impacts of the alternate sources under Alternative B were assumed to be similar to those described for the No Action Alternative; however, potential impacts would be less under Alternative B because less material would be needed from alternate sources.

4.14.6.1 Construction Emissions That Exceed Thresholds

St. Joseph, Waverly, and Jefferson City Segments

No new onshore facilities or dredging-related construction is expected to occur in the St. Joseph, Waverly, or Jefferson City segment. Consequently, no emissions from construction would occur.

Kansas City Segment

Under Alternative B, The Master's Dredging Company likely would construct a new sand plant (Master's–Waldron) in Platte County. Emissions generated by construction activities would be similar to those presented in Table 4.14-1. These emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-1, construction of the Waldron sand plant would not exceed the federal *de minimis* thresholds.

St. Charles Segment

Under Alternative B, the Edward N. Rau Contractor Company likely would construct a new sand plant (Rau–Washington) in Franklin County. Emissions generated by construction would be similar to those presented in Table 4.14-2. These emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-2, construction of the Washington sand plant would not exceed the federal *de minimis* thresholds.

Alternate Sources

To the extent that Alternative B results in construction of new or expanded facilities, potential emissions would be similar to those presented in Tables 4.14-1 and 4.14-2. If multiple facilities, or facilities larger than those analyzed in Tables 4-15.1 and 4.14-2, are constructed simultaneously within the same region, emissions could exceed the *de minimis* thresholds. In the absence of specific information on the number and locations of facilities to be constructed, this impact is considered potentially adverse.

4.14.6.2 Operations Emissions That Exceed Thresholds

St. Joseph, Kansas City, Waverly, and Jefferson City Segments

As previously noted, the St. Charles segment is the only segment in the Project area with counties classified as nonattainment areas with regard to the NAAQS. Consequently, a conformity analysis is required only for the St. Charles segment.

St. Charles Segment

Total emissions generated under Alternative B in Franklin, Madison, St. Charles, and St. Louis Counties are presented in Table 4.14-8. The difference in emissions from existing conditions is compared to the federal *de minimis* thresholds. As shown in Table 4.14-8, implementation of Alternative B would not exceed *de minimis* thresholds. This impact is not considered adverse.

Table 4.14-8 Conformity Analysis for Alternative B^a (tons/year)		
Counties Classified as Nonattainment	VOC	NO _x
Franklin County		
Emissions – Alternative B ^{b,c}	2.23	27.89
Emissions – existing conditions	0.72	9.50
Alternative B minus existing conditions ^d	+1.51	+18.39
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	609	1,465
Adverse effect?	No	No
Madison County		
Emissions – Alternative B ^b	0.41	6.44
Emissions – existing conditions	0.84	13.13
Alternative B minus existing conditions ^d	-0.43	-6.70
Federal <i>de minimis</i> threshold	100	100

Table 4.14-8 Conformity Analysis for Alternative B^a (tons/year)		
Regional significance threshold (10% of regional emissions inventory)	1,647	2,196
Adverse effect?	No	No
St. Charles County		
Emissions – Alternative B ^b	1.02	19.46
Emissions – existing conditions	1.89	36.66
Alternative B minus existing conditions ^d	-0.86	-17.20
Federal <i>de minimis</i> threshold	100	100
St. Charles County (continued)		
Regional significance threshold (10% of regional emissions inventory)	1,365	2,804
Adverse effect?	No	No
St. Louis County		
Emissions – Alternative B ^b	2.40	46.22
Emissions – existing conditions	5.12	95.90
Alternative B minus existing conditions ^d	-2.72	-49.68
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	6,012	6,486
Adverse effect?	No	No

Notes:

VOC = Volatile organic compounds.

NO_x = Nitrogen dioxide.

- ^a Operations of sand plants may generate additional emissions of NO_x and VOC. However, any emissions were assumed to be negligible and would not affect the conformity determination.
- ^b Represents sum total of emissions generated from dredging, materials-handling, and hauling sand and gravel.
- ^c Because construction of an Edward N. Rau Contractor Company sand plant would occur concurrently with dredging activities, emissions generated from construction have been included in the total. Note that these emissions would occur only during 1 year of the 5-year permit period.
- ^d Values may not match as a result of rounding.

Source: Appendix D.

Alternate Sources

Alternative B would result in an increase in dredging and processing at alternate source locations at existing facilities in the short term and (potentially) at new facilities in the long term. As shown in Figure 2.9-1, multiple locations for alternate sources of sand and gravel have been identified throughout Illinois, Kansas, and Missouri. In these states, several counties are classified as federal nonattainment

and maintenance areas. Because replacement sand and gravel most likely would be obtained from sources closest to the existing demand centers along the LOMR, a 25-mile radius was used to identify nonattainment counties most likely to experience increased production from alternate sources.

To the extent that sand and gravel production shifts to locations in these counties, increased dredging activities may contribute to existing violations of the NAAQS. In the absence of specific information on the number and locations of facilities to be constructed, this impact is considered potentially adverse.

4.14.6.3 Increased Health Risks from Exposure of Sensitive Receptors to Diesel Particulate Matter

St. Joseph Segment

Table 4.14-5 indicates that implementation of Alternative B would generate 9.48 additional tons/year of DPM relative to existing conditions in the St. Joseph segment. This increased production likely would result in elevated pollutant concentrations near the sources of DPM, although the exact concentration is unknown.

Under Alternative B, it is likely that dredging may expand to new areas to accommodate the increased amount of material permitted in this segment. Sensitive receptors in these areas that currently are not exposed to dredging activities could be exposed to DPM from dredges and tugboats.

Although DPM concentrations are expected to increase under Alternative B, dredging activities would be permitted for only 5 years. If activities would continue beyond this period, a subsequent environmental analysis would need to be conducted. Any exposure to increased concentrations of DPM would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). In addition, elevated DPM concentrations generated by dredging equipment would dissipate as a function of distance and therefore would be even lower at the closest sensitive land uses. Consequently, Alternative B is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the St. Joseph segment.

Kansas City Segment

Table 4.14-5 indicates that implementation of Alternative B would generate 9.02 fewer tons/year of DPM relative to existing conditions. It therefore is logical to assume that DPM concentrations in the Kansas City segment would be reduced. This is an air quality benefit. Because permitted volumes are

constrained under this alternative, it is not likely that dredging activities would expand to new locations. Consequently, Alternative B is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the Kansas City segment. This impact is not considered adverse.

Waverly Segment

Table 4.14-5 indicates that implementation of Alternative B would generate 5.29 additional tons/year of DPM relative to existing conditions. This increased production likely would result in elevated pollutant concentrations near the sources of DPM, although the exact concentration is unknown.

Under Alternative B, it is likely that dredging may expand to new areas to accommodate the increased amount of material permitted in this segment. Sensitive receptors in these areas that currently are not exposed to dredging activities could be exposed to DPM from dredges and tugboats.

Although DPM concentrations are expected to increase as a result of the Proposed Action, dredging activities would be permitted for only 5 years. If activities would continue beyond this period, a subsequent environmental analysis would need to be conducted. Any exposure to increased concentrations of DPM would be temporary and well below the recommended analysis duration for cancer risk assessments (20 years, recommended by the USEPA; and 70 years, recommended by the OEHHA). In addition, elevated DPM concentrations generated by dredging equipment would dissipate as a function of distance and therefore would be even lower at the closest sensitive land uses. Consequently, Alternative B is not anticipated to expose sensitive receptors to elevated health risks from DPM in the Waverly segment. This impact is not considered adverse.

Jefferson City Segment

Table 4.14-5 indicates that implementation of Alternative B would generate 4.02 fewer tons/year of DPM relative to existing conditions. It therefore is logical to assume that DPM concentrations in the Jefferson City segment would be reduced. This is an air quality benefit. Because permitted volumes are constrained under this alternative, it is not likely that dredging activities would expand to new locations. Consequently, Alternative B is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the Jefferson City segment. This impact is not considered adverse.

St. Charles Segment

Table 4.14-5 indicates that implementation of Alternative B would generate 7.66 fewer tons/year of DPM relative to existing conditions. It therefore is logical to assume that DPM concentrations in the St.

Charles segment would be reduced. This is an air quality benefit. Because permitted volumes are constrained in the St. Charles segment under this alternative, it is not likely that dredging activities would expand to new locations. Consequently, Alternative B is not expected to increase the exposure of sensitive receptors to elevated health risks from DPM in the St. Charles segment. This impact is not considered adverse.

Alternate Sources

If sand and gravel operations at alternate source locations increase in order to meet local demand, emissions of DPM would also increase. This increased production would likely elevate DPM concentrations within the immediate dredging or mining area. Sensitive receptors within 1,000 feet of these sources may therefore be exposed to elevated health risks. While it is likely that many alternate sources would be dredged or mined only until new long-term operations could be developed, some locations could be mined or dredged permanently. Without detailed information on the location of new and existing alternate sources, or on the location of sensitive receptors and the length of dredging operations, it is difficult to determine whether DPM concentrations would result in adverse health effects. Consequently, this is considered a potentially adverse effect.

4.14.6.4 Greenhouse Gas Emissions Resulting in Global Climate Change

All Segments

As shown in Table 4.14-6, the majority of GHG emissions generated under Alternative B would occur in the St. Joseph, Waverly, and St. Charles segments. However, because GHGs accumulate in the atmosphere and affect climate change on a global scale, Alternative B must be evaluated on a Project level, rather than on a segment-by-segment basis.

Total GHG emissions produced by dredging operations in the LOMR are estimated at 31,726 metric tons of CO₂e per year. GHG emissions from construction activities are expected to generate an additional 8,430 metric tons. Amortizing construction emissions over the 5-year permit lifetime results in 33,421 metric tons of CO₂e per year under Alternative B—an increase of approximately 508 metric tons/year relative to existing conditions.

Alternate Sources

Additional GHG emissions would be generated by increased dredging of alternate sources. Assuming that GHG emissions generated by these sources would be similar to emissions produced on the LOMR on a per-ton basis, removal of 1.85 million tons of sand from alternate source locations would generate

approximately 11,600 metric tons of CO₂e per year. When combined with emissions generated along the LOMR and compared to existing conditions, Alternative B is expected to result in an increase of 12,131 metric tons of GHGs per year. This is equivalent to adding approximately 8,087 typical passenger vehicles to the road (USEPA 2009).

Because GHG emissions tend to accumulate globally, it is unlikely that the GHGs emitted under Alternative B would cause an individually discernible impact on global climate change. This impact is not considered adverse.

4.14.7 Alternative C

Although Alternative C would result in minor increases in current dredging operations in all segments of the river, the overall dredging volumes for the combined segments would be maintained. No alternate sources are expected to be required. Similar to the Proposed Action, two new facilities are proposed to meet demand, one in the St. Joseph segment and one in the St. Charles segment. The impacts associated with these facilities were assumed to be the same as described for the Proposed Action.

4.14.7.1 Construction Emissions That Exceed Thresholds

St. Joseph, Waverly, and Jefferson City Segments

No new onshore facilities or dredging-related construction is expected to occur in the St. Joseph, Waverly, or Jefferson City segment. Consequently, no construction emissions would occur.

Kansas City Segment

Under Alternative C, The Master's Dredging Company likely would construct a new sand plant (Master's–Waldron) in Platte County. Emissions generated by construction activities would be similar to those presented in Table 4.14-1. These emissions would be temporary and would cease when construction is complete. As shown in Table 4.14-1, construction of the Waldron sand plant would not exceed the federal *de minimis* thresholds.

St. Charles Segment

Under Alternative C, the Edward N. Rau Contractor Company likely would construct a new sand plant (Rau–Washington) in Franklin County. Emissions generated by construction would be similar to those presented in Table 4.14-2. These emissions would be temporary and would cease when construction

is complete. As shown in Table 4.14-2, construction of the Washington sand plant would not exceed the federal *de minimis* thresholds.

Alternate Sources

Alternative C would not result in new construction at alternate sources of supply. Therefore, no emissions would be associated with new construction at alternate sources under Alternative C.

4.14.7.2 Operations Emissions That Exceed Thresholds

St. Joseph, Kansas City, Waverly, and Jefferson City Segments

As previously noted, the St. Charles segment is the only segment in the Project area with counties classified as nonattainment areas with regard to the NAAQS. Consequently, a conformity analysis is required only for the St. Charles segment.

St. Charles Segment

Total emissions generated under Alternative C in Franklin, Madison, St. Charles, and St. Louis Counties are presented in Table 4.14-9. The difference in emissions from existing conditions is compared to the federal *de minimis* thresholds. As shown in Table 4.14-9, implementation of the Proposed Action would not exceed *de minimis* thresholds. This impact is not considered adverse.

Alternate Sources

Alternative C would not result in expanded dredging or processing at alternate sources. Therefore, no emissions would be associated with expanded dredging or processing at alternate sources under Alternative C.

Table 4.14-9 Conformity Analysis for Alternative C^a (tons/year)

Counties Classified as Nonattainment	VOC	NO _x
Franklin County		
Emissions – Alternative C ^{b,c}	3.02	41.59
Emissions – existing conditions	0.72	9.50
Alternative C minus existing conditions ^d	+2.30	+32.09
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	609	1,465
Adverse effect?	No	No

Table 4.14-9 Conformity Analysis for Alternative C^a (tons/year)

Counties Classified as Nonattainment	VOC	NO _x
Madison County		
Emissions – Alternative C ^b	0.80	12.65
Emissions – existing conditions	0.84	13.13
Alternative C minus existing conditions ^d	-0.04	-0.48
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	1,647	2,196
Adverse effect?	No	No
St. Charles County		
Emissions – Alternative C ^b	0.98	26.40
Emissions – existing conditions	0.55	5.65
Alternative C minus existing conditions ^d	+0.48	+6.18
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	1,365	2,804
Adverse effect?	No	No
St. Louis County		
Emissions – Alternative C ^b	4.72	90.79
Emissions – existing conditions	5.12	95.90
Alternative C minus existing conditions ^d	-0.40	-5.12
Federal <i>de minimis</i> threshold	100	100
Regional significance threshold (10% of regional emissions inventory)	6,012	6,486
Adverse effect?	No	No

Notes:

VOC = Volatile organic compounds.

NO_x = Nitrogen dioxide.

- ^a Operations of sand plants may generate additional emissions of NO_x and VOC. However, any emissions were assumed to be negligible and would not affect the conformity determination.
- ^b Represents sum total of emissions generated from dredging, materials-handling, and hauling sand and gravel.
- ^c Because construction of an Edward N. Rau Contractor Company sand plant would occur concurrently with dredging activities, emissions generated from construction have been included in the total. Note that these emissions would occur only during 1 year of the 5-year permit period.
- ^d Values may not match as a result of rounding.

Source: Appendix D.

4.14.7.3 Increased Health Risks from Exposure of Sensitive Receptors to Diesel Particulate Matter

St. Joseph Segment

Table 4.14-5 indicates that implementation of Alternative C would generate 0.23 fewer tons/year of DPM relative to existing conditions. It is unlikely that this minor reduction in production would affect DPM concentrations. Because permitted volumes would increase by only 0.94 percent, it also is unlikely that dredging would expand to new locations. Consequently, adverse impacts on sensitive receptors from exposure to DPM nearest the Holliday Sand & Gravel Company sand plant and throughout the segment would be similar to existing conditions.

Kansas City Segment

Table 4.14-5 indicates that implementation of Alternative C would generate 0.96 additional tons/year of DPM relative to existing conditions. It is unlikely that this minor increase in production would affect DPM concentrations. Because permitted volumes would increase by only 0.04 percent, it is unlikely that dredging would expand to new locations. Consequently, there is no potential for sensitive receptors throughout the Kansas City segment to be exposed to elevated health risks from DPM.

Waverly Segment

Table 4.14-5 indicates that implementation of Alternative C would generate 0.17 additional tons/year of DPM relative to existing conditions. It is unlikely that this minor increase in production would affect DPM concentrations. Because permitted volumes would increase by only 0.30 percent, it also is unlikely that dredging would expand to new locations. Consequently, exposure of sensitive receptors to DPM nearest the onshore facility and throughout the segment would be similar to existing conditions.

Jefferson City Segment

Table 4.14-5 indicates that implementation of Alternative C would generate 0.17 fewer tons/year of DPM relative to existing conditions. It is unlikely that this minor reduction in production would affect DPM concentrations. Because permitted volumes would increase by only 0.07 percent, it also is unlikely that dredging would expand to new locations. Consequently, exposure of sensitive receptors to DPM nearest the onshore facility and throughout the segment would be similar to existing conditions.

St. Charles Segment

Table 4.14-5 indicates that implementation of Alternative C would generate 1.58 additional tons/year of DPM relative to existing conditions. It is unlikely that this minor increase in production would affect DPM concentrations. Because permitted volumes would increase by only 0.04 percent, it also is unlikely that dredging would expand to new locations. Consequently, exposure of sensitive receptors to DPM nearest the onshore facility and throughout the segment would be similar to existing conditions.

Alternate Sources

Alternate sources would not be required under Alternative C. Therefore, DPM would not increase at alternate source locations, and no related increased health risks would occur at sensitive receptors from exposure to DPMs.

4.14.7.4 Greenhouse Gas Emissions Resulting in Global Climate Change

All Segments

As shown in Table 4.14-6, the majority of GHG emissions generated by Alternative C would occur in the Kansas City and St. Charles segments. However, because GHGs accumulate in the atmosphere and affect climate change on a global scale, Alternative C must be evaluated on a Project level, rather than on a segment-by-segment basis.

Total GHG emissions produced by dredging operations are estimated at 36,542 metric tons of CO₂e per year (Table 4.14-1). GHG emissions from construction activities are expected to generate an additional 8,430 metric tons. Amortizing the construction emissions over the 5-year permit lifetime results in 38,228 metric tons of CO₂e per year under Alternative C—an increase of 5,324 metric tons over existing conditions. This is equivalent to adding approximately 3,550 typical passenger vehicles to the road (USEPA 2009).

As previously noted, GHG emissions tend to accumulate in the atmosphere because of their relatively long lifespan. As a result, their impact on climate change is mostly independent of the point of emission. In other words, GHG emissions are more appropriately evaluated on a regional, state, or even national scale than on an individual project level. Further, it is unlikely that the GHGs emitted as part of Alternative C would cause an individually discernible impact on global climate change. This impact is not considered adverse.

Alternate Sources

Alternate sources would not be required under Alternative C. Therefore, no contributions to GHG emissions would occur.

4.14.8 Summary of Impacts

Table 4.14-10 contains a summary of potential impacts on air quality and climate change for the Proposed Action and alternatives.

Table 4.14-10 Summary of Potential Impacts for Air Quality and Climate Change

Impact Category	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Construction emissions (volatile organic compounds [VOC], oxides of nitrogen [NO _x], carbon monoxide [CO], and particulate matter [PM])	<ul style="list-style-type: none"> Minimal direct temporary emissions of VOC, NO_x, CO, and PM in the Kansas City and St. Charles segments from construction of new sand and gravel facilities. 	<ul style="list-style-type: none"> Direct temporary emissions of VOC, NO_x, CO, and PM in alternate source locations requiring construction or expansion of sand and gravel facilities. 	<ul style="list-style-type: none"> Minimal direct temporary emissions of VOC, NO_x, CO, and PM in the Kansas City and St. Charles segments from construction of new sand and gravel facilities. Direct temporary emissions of VOC, NO_x, CO, and PM in alternate source locations requiring construction or expansion of sand and gravel facilities. 	<ul style="list-style-type: none"> Minimal direct temporary emissions of VOC, NO_x, CO, and PM in the Kansas City and St. Charles segments from construction of new sand and gravel facilities. Direct temporary emissions of VOC, NO_x, CO, and PM in alternate source locations requiring construction or expansion of sand and gravel facilities. 	<ul style="list-style-type: none"> Minimal direct temporary emissions of VOC, NO_x, CO, and PM in the Kansas City and St. Charles segments from construction of new sand and gravel facilities.
Conformity	<ul style="list-style-type: none"> Long-term direct emissions of NO_x in St. Louis County in excess of federal <i>de minimis</i> thresholds. 	<ul style="list-style-type: none"> Potential long-term direct emissions of NO_x in alternate source locations in excess of federal <i>de minimis</i> thresholds. 	<ul style="list-style-type: none"> Potential long-term direct emissions of NO_x in alternate source locations in excess of federal <i>de minimis</i> thresholds. 	<ul style="list-style-type: none"> Potential long-term direct emissions of NO_x in alternate source locations in excess of federal <i>de minimis</i> thresholds. 	<ul style="list-style-type: none"> No effect beyond those posed by existing conditions.
Diesel particulate matter (DPM)	<ul style="list-style-type: none"> Negligible long-term indirect exposure of existing sensitive receptors to DPM from increased dredging activities in all river segments. Negligible long-term indirect exposure of new sensitive receptors to DPM from increased dredging activities in all river segments. 	<ul style="list-style-type: none"> Potentially adverse long-term indirect exposure of existing and new sensitive receptors to DPM from increased dredging activities in alternate source locations. 	<ul style="list-style-type: none"> Negligible long-term indirect exposure of existing and new sensitive receptors to DPM from increased dredging activities in the St. Joseph and Waverly segments. Potentially adverse long-term indirect exposure of existing and new sensitive receptors to DPM from increased dredging activities in alternate source locations. 	<ul style="list-style-type: none"> Negligible long-term indirect exposure of existing and new sensitive receptors to DPM from increased dredging activities in the St. Joseph and Waverly segments. Potentially adverse long-term indirect exposure of existing and new sensitive receptors to DPM from increased dredging activities in alternate source locations. 	<ul style="list-style-type: none"> No effect beyond those posed by existing conditions.

Table 4.14-10 Summary of Potential Impacts for Air Quality and Climate Change

Impact Category	Proposed Action	No Action Alternative	Alternative A	Alternative B	Alternative C
Greenhouse gas (GHG)	<ul style="list-style-type: none"> • High long-term direct GHG emissions from dredging of the LOMR. • Temporary direct GHG emission from construction activities. 	<ul style="list-style-type: none"> • Minimal long-term direct GHG emissions from dredging of alternate sources. • Temporary direct GHG emission from construction activities. 	<ul style="list-style-type: none"> • Moderate long-term direct GHG emissions from dredging of the LOMR and alternate sources. • Temporary direct GHG emission from construction activities. 	<ul style="list-style-type: none"> • Moderate long-term direct GHG emissions from dredging of the LOMR and alternate sources. • Temporary direct GHG emission from construction activities. 	<ul style="list-style-type: none"> • Low long-term direct GHG emissions from dredging of the LOMR. • Temporary direct GHG emission from construction activities.

Note: LOMR = Lower Missouri River.

4.14.9 References

4.14.9.1 Printed Literature

CARB (California Air Resources Board). 2000. Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles. October. Sacramento, CA.

MDNR (Missouri Department of Natural Resources). 2007. 2002 Base Year Emissions Inventory for the Missouri Portion of the St. Louis 8-hour Ozone Nonattainment Area. Adopted May 31, 2007. Jefferson City, MO.

Sutley, Nancy H. 2010. Memorandum for Heads of Federal Departments and Agencies. Draft NUSEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions. February 18, 2010. Website (http://ceq.hss.doe.gov/nepa/regs/Consideration_of_Effects_of_GHG_Draft_NUSEPA_Guidance_FINAL_02182010.pdf) accessed on March 29, 2010.

USEPA (U.S. Environmental Protection Agency). 2009. Emission Facts. Greenhouse Gas Emissions from a Typical Passenger Car. Last Revised: November 24, 2009. Website (<http://www.epa.gov/OMS/climate/420f05004.htm>) accessed on January 13, 2010.

USEPA (U.S. Environmental Protection Agency). 2005. Guidelines for Carcinogen Risk Assessment. (USEPA/630/P-03/001F.) Washington, DC.

4.14.9.2 Personal Communication

Basham, Aaron. Missouri Department of Natural Resources. Jefferson City, Missouri —Email to Laura Smith, ICF International, May 12, 2010.