

## **APPENDIX F**

---

### **AIR QUALITY**

Past planning documents identified a “Chicago to Omaha” corridor, so for the purposes of this appendix, the corridor reference will remain as previously designated; however, the project name includes “Council Bluffs” in the title.

**This page intentionally left blank**

| Build Alternative Emission Calculations          |                                                               |                            |                             |                                                            |                               |                                |                                                              |                               |                                |                                                            |                               |                                |                        |
|--------------------------------------------------|---------------------------------------------------------------|----------------------------|-----------------------------|------------------------------------------------------------|-------------------------------|--------------------------------|--------------------------------------------------------------|-------------------------------|--------------------------------|------------------------------------------------------------|-------------------------------|--------------------------------|------------------------|
| Pollutant                                        | Additional passenger train emissions                          |                            |                             | Automobile Emissions Diverted                              |                               |                                | Airline Emissions Diverted                                   |                               |                                | Bus Emissions Diverted                                     |                               |                                | Net Change<br>(ton/yr) |
|                                                  | Emission Factor <sup>[1],[4]</sup><br>(g/gal)<br>(lb/gal) CO2 | Emissions Added<br>(lb/yr) | Emissions Added<br>(ton/yr) | Emission Factor <sup>[2]</sup><br>(g/mile)<br>(lb/gal) CO2 | Emissions Diverted<br>(lb/yr) | Emissions Diverted<br>(ton/yr) | Emission Factor <sup>[3],[4]</sup><br>(g/kg)<br>(lb/gal) CO2 | Emissions Diverted<br>(lb/yr) | Emissions Diverted<br>(ton/yr) | Emission Factor <sup>[2]</sup><br>(g/mile)<br>(lb/gal) CO2 | Emissions Diverted<br>(lb/yr) | Emissions Diverted<br>(ton/yr) |                        |
| Hydrocarbons                                     | 5.8                                                           | 146,911                    | 73.46                       | 0.4272                                                     | 245,782                       | 122.89                         | 0.7                                                          | 1,129                         | 0.56                           | 0.1581                                                     | 90,938                        | 45.47                          | -95.47                 |
| Carbon monoxide (CO)                             | 38.1                                                          | 965,054                    | 482.53                      | 3.3467                                                     | 1,925,529                     | 962.76                         | 4.4                                                          | 7,096                         | 3.55                           | 1.2706                                                     | 731,020                       | 365.51                         | -849.30                |
| Nitrogen oxides (NO <sub>x</sub> )               | 131                                                           | 3,318,166                  | 1,659.08                    | 3.4469                                                     | 1,983,165                     | 991.58                         | 14.1                                                         | 22,739                        | 11.37                          | 1.2978                                                     | 746,697                       | 373.35                         | 282.78                 |
| PM <sub>10</sub>                                 | 3.4                                                           | 86,120                     | 43.06                       | 0.1698                                                     | 97,702                        | 48.85                          |                                                              |                               |                                | 0.0644                                                     | 37,036                        | 18.52                          | -24.31                 |
| PM <sub>2.5</sub>                                | 3.298                                                         | 83,537                     | 41.77                       | 0.1411                                                     | 81,190                        | 40.60                          |                                                              |                               |                                | 0.0545                                                     | 31,384                        | 15.69                          | -14.52                 |
| SO <sub>2</sub> <sup>[5]</sup>                   | 0.096                                                         | 2,432                      | 1.22                        | 0.0071                                                     | 4,093                         | 2.05                           | 0.4                                                          | 645                           | 0.32                           | 0.0024                                                     | 1,376                         | 0.69                           | -1.84                  |
| Carbon dioxide <sup>[4]</sup> (CO <sub>2</sub> ) | 22.377                                                        | 257,326,517                | 128,663.26                  | 17.681                                                     | 212,216,475                   | 106,108.24                     | 21.098                                                       | 5,149,656                     | 2,575                          | 22.377                                                     | 71,608,494                    | 35,804.25                      | -15,824.05             |

<sup>[1]</sup> Except CO2, emission factors from EPA document EPA420-F-09-025; Emission Factors for Locomotives; Dated April 2009. Emission factors are projected calendar year 2015 emission factors for passenger/commuter locomotives (Tier 4).

<sup>[2]</sup> Emission factors from data output from EPA Moves2010b model run for 2015.

<sup>[3]</sup> Except CO2, emission factors from US Department of Transportation Federal Highway Administration document "Assessing the Effects of Freight Movement on Air Quality at the National and Regional Level; Final Report; April 2005". Emission factors are projected for 2015.

<sup>[4]</sup> CO2 Emission factors from US Department of Transportation Energy Information Administration Voluntary Reporting of Greenhouse Gases Program - Coefficients webpage. Emission factors are in units of lb/gal.

<sup>[5]</sup> Train SO<sub>2</sub> emission factor calculated based on 15 ppm (weight basis) diesel fuel sulfur content: (15 ppm S/1,000,000) x (7.05 lb/gal) x (454 g/lb) x (2 lb SO2/lb S) = 0.096 g/gal

| Chicago to Omaha Intercity Passenger Rail Service - Estmate of Diverted Trips |             |                                  |
|-------------------------------------------------------------------------------|-------------|----------------------------------|
| Service C                                                                     | Quantity    | Source                           |
| Total Annual Ridership                                                        | 1,294,000   | AECOM Ridership Forecast 9/17/12 |
| New Trips from induced growth                                                 | 128,500     | AECOM Ridership Forecast 9/17/12 |
| Amount of Diverted Trips                                                      | 1,165,500   | AECOM Ridership Forecast 9/17/12 |
| Auto Percent of Diverted Trips                                                | 78.9%       | 919,500                          |
| Bus Percent of Diverted Trips                                                 | 18.7%       | 218,500                          |
| Air Percent of Diverted Trips                                                 | 2.4%        | 27,500                           |
| Auto                                                                          |             |                                  |
| Auto miles one way                                                            | 473         | miles - Google Earth Pro         |
| Nationwide % passenger cars                                                   | 60.3%       | Percent <sup>a</sup>             |
| Nationwide % passenger trucks                                                 | 39.7%       | Percent <sup>a</sup>             |
| Average passenger car energy intensity                                        | 3,538       | Btu/passenger mile               |
| Average passenger truck energy intensity                                      | 3,663       | Btu/passenger mile               |
| Average passengers per car                                                    | 1.55        | passengers/vehicle <sup>a</sup>  |
| Average passengers per truck                                                  | 1.84        | passengers/vehicle <sup>a</sup>  |
| Total diverted auto passenger miles per year                                  | 434,924,000 | passenger-miles/year             |
| Annual diverted auto fuel consumption                                         | 1,560,327   | MMBtu/yr                         |
| Gasoline heating value                                                        | 130,000     | Btu/gal - USEPA AP-42 Appendix A |
| Annual auto fuel consumption diverted                                         | 12,002,515  | gallons per year                 |
| Annual auto miles diverted                                                    | 261,209,725 | miles per year                   |
| Bus                                                                           |             |                                  |
| Intercity passenger bus energy intensity <sup>a</sup>                         | 4,242       | Btu/passenger mile               |
| One-way distance                                                              | 473         | miles - Google Earth Pro         |
| Total diverted bus passenger miles per year                                   | 103,350,500 | passenger-miles/year             |
| Annual diverted bus fuel consumption                                          | 438,413     | MMBtu/yr                         |
| Diesel fuel heating value                                                     | 137,000     | Btu/gal - USEPA AP-42 Appendix A |
| Annual diverted bus fuel consumption                                          | 3,200,094   | gallons per year                 |
| Train                                                                         |             |                                  |
| Intercity passenger train energy intensity <sup>a</sup>                       | 2,435       | Btu/passenger mile               |
| One-way distance                                                              | 500         | miles                            |
| Total new train passenger miles per year                                      | 647,000,000 | passenger-miles/year             |
| Annual new passenger train fuel consumption                                   | 1,575,445   | MMBtu/yr                         |
| Diesel fuel heating value                                                     | 137,000     | Btu/gal - USEPA AP-42 Appendix A |
| Annual new passenger train fuel consumption                                   | 11,499,599  | gallons per year                 |
| Air                                                                           |             |                                  |
| Air transportation energy intensity <sup>a</sup>                              | 2,826       | Btu/passenger mile               |
| One-way distance                                                              | 424         | miles - Google Earth Pro         |
| Total diverted air passenger miles per year                                   | 11,660,000  | passenger-miles/year             |
| Jet fuel heating value                                                        | 135,000     | Btu/gal <sup>a</sup>             |
| Jet fuel density                                                              | 6.60        | lb/gal                           |
| Annual air fuel consumption diverted                                          | 32,951      | MMBtu/yr                         |
| Annual air fuel consumption diverted                                          | 244,083     | gal/yr                           |
| Annual air fuel consumption diverted                                          | 731,369     | kg/yr                            |

<sup>a</sup> US Department of Energy Transportation Energy Data Book: Edition 30-2011.