3.7 AIR QUALITY AND ENERGY

3.7.1 Air Quality

This section describes the existing conditions for air quality in Section 3.7.1 and energy in Section 3.7.2 for the project study area, and the potential impacts from the Preferred Alternative.

3.7.1.1 Introduction to Analysis

Summary of Results

The Preferred Alternative is in compliance with the regional transportation conformity requirements and would not cause any regional air quality impacts for criteria pollutants. The Preferred Alternative would result in mobile source air toxics (MSAT) emissions comparable to the No Action Alternative. Carbon monoxide (CO) hot spot analysis demonstrated that during operation, the Preferred Alternative would not cause particulate matter with diameters equal or less than 10 micron (PM_{10}) or CO violations to National Ambient Air Quality Standards (NAAQS).

Purpose

Analyzing the Preferred Alternative's potential impacts and benefits related to air quality is a necessary element of this Environmental Evaluation.[1]

3.7.1.2 Affected Environment

Implementation of the Preferred Alternative could impact air quality beyond the project study area. For this reason, the analysis considers impacts to the air quality of the entire Denver metropolitan area, which includes the counties of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, and parts of Larimer and Weld counties.

The concentration of a pollutant in the atmosphere depends on the amount of pollutant released, the nature of the source, and the ability of the atmosphere to transport and disperse the pollutant. The main determinants of transport and dispersion are wind, atmospheric stability or turbulence, topography, and the existence of inversion layers. The Denver metropolitan area is located in the South Platte River drainage area, with mountains located to the west and relatively high terrain to the south and north. Under certain meteorological conditions, the local topography tends to trap pollutants and elevate ambient air concentrations. The pollutants can be trapped under strong inversions that inhibit dispersion and cause poor air quality.

The United States Environmental Protection Agency (USEPA) has established NAAQS for seven criteria pollutants to protect the public from the adverse health effects associated with air pollution. These seven pollutants are CO, ozone (O_3), nitrogen oxides (NO_x), sulfur dioxide (SO_2), PM_{10}, particulate matter with aerodynamic diameter less than 2.5 micron ($PM_{2.5}$), and lead (Pb). The NAAQS are shown in Table 3.7-1. NAAQS have two types of standards. Primary standards are established to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly, with an adequate margin

[1] Clean Air Act, NAAQS.

of safety. Secondary standards are established to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

TABLE 3.7-1. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	National Standards	
		Primary	Secondary
O_3	8-hour[1] 1-hour[2]	0.075 ppm 0.12 ppm	0.075 ppm 0.12 ppm
CO	8-hour[3] 1-hour[3]	9 ppm 35 ppm	– –
NO_2	Annual average	100 $\mu g/m^3$	100 $\mu g/m^3$
SO_2	Annual average 24-hour[3] 3-hour[3]	80 $\mu g/m^3$ 365 $\mu g/m^3$ –	– – 1,300 $\mu g/m^3$
PM_{10}	Annual arithmetic mean[4] 24-hour[5]	– 150 $\mu g/m^3$	– 150 $\mu g/m^3$
$PM_{2.5}$	Annual arithmetic mean[6] 24-hour[7]	15 $\mu g/m^3$ 35 $\mu g/m^3$	15 $\mu g/m^3$ 35 $\mu g/m^3$
Pb	Quarterly arithmetic mean	0.15 $\mu g/m^3$	0.15 $\mu g/m^3$

Source: USEPA, 2009.
Notes:
[1] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor over each year must not exceed 0.075 ppm.
[2] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than one. The project area is still subject to the 1-hour standard because of the EAC plan.
[3] Not to be exceeded more than once per calendar year.
[4] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the USEPA revoked the annual respirable PM_{10} NAAQS in 2006 (effective December 17, 2006).
[5] Not to be exceeded more than once per year on average over 3 years.
[6] To attain this standard, the 3-year average of the weighted annual mean respirable $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 $\mu g/m^3$.
[7] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).
NO_2 = nitrogen dioxide
ppm = parts per million
$\mu g/m^3$ = micrograms per meters cubed

Based on air quality monitoring data collected on a continuous basis and analyzed over several years, state and federal air quality agencies designate regions as having either "attainment" or "non-attainment" status for criteria pollutants as per the NAAQS. Attainment status indicates compliance with the NAAQS. Once a non-attainment area achieves compliance with the NAAQS, the area is considered an air quality "attainment/maintenance" area until the standard has been maintained for 10 years and a long-term maintenance plan has been approved by USEPA. Non-attainment status indicates that the region is not compliant with NAAQS.

The Denver metropolitan area is designated as an attainment/maintenance area for CO and PM_{10}. No violations of the NAAQS for these pollutants have been recorded in the Denver metropolitan area since 1995.

USEPA designated the Denver metropolitan and Northern Front Range area as a nonattainment area for the federal 8-hour O_3 standard as a result of a violation of the 1997

8-hour O_3 standard of 0.080 ppm. The effective date of the nonattainment designation was November 20, 2007. A detailed State Implementation Plan (SIP) to reduce O_3 has been developed by the Colorado Department of Public Health and Environment's Colorado Air Pollution Control Division (APCD), along with the Regional Air Quality Council (RAQC), the Denver Regional Council of Governments (DRCOG), and the North Front Range Metropolitan Planning Organization. This plan was submitted to USEPA in 2009 to demonstrate compliance with the 8-hour O_3 standard. In addition, in March 2008, the USEPA revised the 8-hour O_3 standard from 0.08 ppm to 0.075 ppm. A revised SIP for the new standard must be submitted to the USEPA in 2013.

Pollutants of Primary Concern

A transportation project can affect regional air quality when emissions of O_3 precursors (NO_x and volatile organic compounds [VOC]) from traffic are greater if the project is implemented than if not. Because the region is designated as attainment/maintenance area for CO and PM_{10}, the project is subject to project level transportation conformity requirements. Near areas of heavy traffic congestion where average vehicle speeds are low, CO and PM_{10} concentrations can accumulate. Therefore, emissions of CO and PM_{10} are of primary concern when assessing local air quality impacts. The project area is designated nonattainment for O_3. However, because O_3 is a pollutant of regional concern, no project-level analysis requirements apply for this pollutant.

$PM_{2.5}$ can be emitted from combustion sources including on-road vehicles and non-road equipment. The Denver area is currently designated as attainment for $PM_{2.5}$. In the past few years, the $PM_{2.5}$ annual concentrations and the 3-year average of the 98th percentile 24-hour concentrations did not exceed NAAQS in the project area. Therefore, $PM_{2.5}$ was not considered as a pollutant of primary concern for this project. Detailed analyses of $PM_{2.5}$ were not included in this report. Similarly, the area is classified as attainment for SO_2 NAAQS in the project area, thus no detailed analyses were performed.

Mobile Source Air Toxics

In addition to the criteria pollutants, MSAT emissions may cause air quality concerns. The USEPA's national emission control programs are projected to reduce MSAT emissions by 60 to 80 percent by 2035. These programs include the use of reformulated gasoline, the national low emission vehicle program, and stricter standards for passenger vehicles. Additional programs include the following: new on-road diesel vehicles are subject to stringent emission standards and emission control requirements (which started in 2007); the allowable sulfur content in diesel fuel will be drastically reduced from 500 ppm to 15 ppm by December 31, 2009; and new locomotives will be required to comply with Tier 2 emission standards. Local conditions may differ from the national reduction projections due to area-specific conditions such as fleet mix, vehicle turnover, vehicle miles traveled (VMT) growth projections, and local emission control requirements. However, the anticipated effectiveness of USEPA's emission control measures is so great, even after accounting for variations in local conditions, that MSAT emissions in the study area are likely to be lower in the future.

Air Monitoring Data

The Colorado Department of Public Health and Environment's APCD operates a network of ambient air quality monitoring stations within the Denver metropolitan area. Monitoring stations near the project study area were selected to evaluate the existing air quality conditions of the project area. Table 3.7-2 lists the maximum CO, O_3, PM_{10}, and $PM_{2.5}$

concentrations measured from 2006 through 2008 for the monitoring stations and displays the NAAQS for comparison.

TABLE 3.7-2. SUMMARY OF AMBIENT MONITORING LEVELS FOR MONITORING STATIONS IN THE STUDY AREA

Monitoring Station	Averaging Time	NAAQS	2006	2007	2008
CO parts per million (ppm)[1]					
Welby – 3174 East 78th Avenue	1-hour (2nd Max.)	35.0	3.8	3.0	3.1
	8-hour (2nd Max.)	9.0	2.5	2.1	1.7
Denver – CAMP, 2105 Broadway, Denver	1-hour (2nd Max.)	35.0	4.6	5.9	7.0
	8-hour (2nd Max.)	9.0	3.1	2.8	2.3
Longmont – 440 Main Street	1-hour (2nd Max.)	35.0	2.8	3.4	3.3
	8-hour (2nd Max.)	9.0	1.8	1.9	2.4
O_3 (ppm) [1]					
Welby – 3174 East 78th Avenue	1-hour (Max.) [2]	(0.12)	0.089	0.098	0.100
	8-hour (4th Max.)	0.075	0.069	0.070	0.076
Denver – CAMP, 2105 Broadway, Denver	1-hour (Max.)	(0.12)	0.085	0.084	NA
	8-hour (4th Max.)	0.075	0.069	0.070	NA
Boulder – 1405 1/2 S. Foothills Parkway	1-hour (Max.)	(0.12)	0.099	0.104	0.89
	8-hour (4th Max.)	0.075	0.082	0.085	0.076
Arvada – 9101 West 57th Avenue	1-hour (Max.)	(0.12)	0.099	0.095	0.093
	8-hour (4th Max.)	0.075	0.082	0.079	0.074
PM_{10} micrograms per cubic meter ($\mu g/m^3$)[1]					
Welby – 3174 East 78th Avenue	24-hour (2nd Max.)	150	82	73	63
	Annual Arith. Mean	(50)	28	30	27
Denver CAMP – 2105 Broadway – Camp	24-hour (2nd Max.)	150	61	67	56
	Annual Arith. Mean	(50)	29	28	30
Longmont - 350 Kimbark Street	24-hour (2nd Max.)	150	35	48	35
	Annual Arith. Mean	(50)	20	23	21
Boulder - 2440 Pearl Street	24-hour (2nd Max.)	150	34	59	46
	Annual Arith. Mean	(50)	17	22	21
$PM_{2.5}$ micrograms per cubic meter (μg/m3)[1]					
Boulder - 2440 Pearl Street	24-hour (98th percentile)	35	15.7	25.0	17.1
	Annual Arith. Mean	15	6.72	7.40	6.49
Longmont - 350 Kimbark Street	24-hour (98th percentile)	35	20	28	23
	Annual Arith. Mean	15	7.98	8.86	7.73

TABLE 3.7-2. SUMMARY OF AMBIENT MONITORING LEVELS FOR MONITORING STATIONS IN THE STUDY AREA

Monitoring Station	Averaging Time	NAAQS	2006	2007	2008
Denver CAMP – 2105 Broadway – Camp	24-hour (98th percentile)	35	24.3	37.2	19.4
	Annual Arith. Mean	15	8.90	10.73	7.90

Source: USEPA, 2009.
Notes:
[1] If a monitoring station had more than one monitor for a pollutant, the highest reading among the monitors was used.
[2] On June 15, 2005, the 1-hour O_3 standard of 0.12 ppm was revoked for all areas except the 8-hour O_3 nonattainment Early Action Compact (EAC) areas. Denver was previously an EAC area, and was re-designated as nonattainment for 8-hour O_3 in November 2007.
[3] USEPA revoked the annual respirable PM_{10} NAAQS in 2006 (effective December 17, 2006).
Max. = maximum
NA = No data was reported for this year.

Air monitoring data indicate that the air quality in the project study area meets the NAAQS for CO, PM_{10}, and Pb. There were some incidents when the maximum 24-hour concentrations of $PM_{2.5}$ were measured higher than the NAAQS of 35 ppm. To attain the $PM_{2.5}$ NAAQS, the 3-year average of the 98th percentile 24-hour concentrations in the project study area must not exceed 35 ppm. Because the 3-year average of the 98th percentile $PM_{2.5}$ concentrations was below 35 ppm, the project study area is in attainment for $PM_{2.5}$. No such exceedance has been calculated within the project study area.

Several monitors in the Denver metropolitan area have measured violations of the new 8-hour O_3 standard (0.075 ppm). An O_3 exceedance occurs when the 3-year average of the 4th maximum 8-hour O_3 concentration exceeds this value. In this case, 8-hour O_3 data have exceeded NAAQS in the project area.

3.7.1.3 Impact Evaluation

Impacts on air quality were analyzed for the No Action Alternative and Preferred Alternative. This analysis includes the impacts to air quality from emissions of those criteria pollutants of concern previously discussed and the six MSATs.

The air quality analysis accounted for all 11 stations that are part of the Preferred Alternative. However, because only seven of these stations are currently funded, the air quality analysis also examined a scenario with only the seven funded stations for comparison. The 41st Avenue East and Pecos stations are part of the Gold Line project (Federal Transit Administration [FTA] 2009).

<u>Methodology</u>

Direct Impacts

<u>Air Quality Conformity</u>

Federal transportation and air quality conformity regulations were developed during the 1990s to ensure that transportation plans, programs, and projects would not jeopardize attainment of NAAQS. In order to receive transportation funding or approvals, state and local transportation agencies with plans, programs, or projects in non-attainment or maintenance areas must demonstrate that they meet the transportation conformity requirements of the Clean Air Act as set forth in the transportation conformity rule. Transportation conformity is a way to ensure that:

- Planning for transportation systems is consistent with and conforms to state air quality plans for attaining and maintaining the health-based NAAQS.
- Neither the transportation system as a whole nor individual transportation projects cause new air quality violations or worsen existing violations.

The analysis demonstrates the project meets the regional conformity requirement by its inclusion in the fiscally constrained *2035 Metro Vision Regional Transportation Plan* (*MVRTP*) and the *2008-2013 Transportation Improvement Program* (TIP). In addition, because the project study area is in attainment/maintenance for CO and PM_{10}, a project level conformity analysis was performed for these two pollutants.

Regional and Corridor Criteria Pollutant Emissions

Air quality impacts from emissions of O_3 precursors (VOC and NO_x), CO, and PM_{10} were evaluated for the No Action and the Preferred Alternative during project operation. Regional and corridor-wide criteria pollutant emissions were evaluated for 2005, 2015, and 2035 for the No Action and the Preferred Alternative. Vehicle exhaust also includes emissions of $PM_{2.5}$ and SO_2. $PM_{2.5}$ emissions were calculated and presented in this analysis for information purposes. The project area is in attainment with the $PM_{2.5}$ and SO_2 NAAQS. Therefore, impacts of $PM_{2.5}$ and SO_2 emissions are not discussed further.

Regional emissions from vehicle travel within the entire Denver metropolitan area were evaluated using the USEPA MOBILE6.2 emission factors provided by APCD along with the regional VMT data for both the No Action Alternative and the Preferred Alternative. Vehicle emissions were evaluated for the years 2015 and 2035. Existing emissions were evaluated for the year 2005.

Corridor-wide emissions included the combustion exhaust emissions from the diesel engines on the diesel multiple unit (DMU) trains. It was assumed that each DMU train car would be individually powered by multiple onboard engines (three heavy duty diesel engines per train car). The DMU train emissions were calculated using the total miles traveled per DMU train, the number of cars per train, and the number of train trips per day for passenger service. Emission factors used for each DMU engine were derived from the USEPA MOBILE6.2 program for heavy duty diesel trucks. Detailed calculations of train schedule and miles traveled for the Northwest Rail (NWR) Corridor are presented in the Air Quality Technical Report (HMMH 2009).

Quantitative emission estimates were conducted for the corridor including all 11 stations and a scenario including only the seven funded stations. However, it was determined that the differences in corridor-wide emissions between these two scenarios are negligible. The DMU train schedule and daily VMT were assumed to be similar for both scenarios. The only difference would be that under the 11 station scenario, trains would stop at four more stations to drop off and pick up passengers. This difference creates slightly more idle time under the 11 station scenario, but would not result in a measurable difference between the two scenarios.

Localized CO Impacts

CO hot spot analyses were performed using air dispersion models to predict worst-case CO levels near most congested, high traffic intersections and at the largest NWR stations.

Intersection CO Analysis

According to the Regional Transportation District's (RTD) *Environmental Methodology Manual* (RTD 2006), the CO hot spot analysis is required at locations within the station study area with a level of service (LOS) that is predicted to degrade from acceptable (A to C) to unacceptable (D to F) when compared to the No Action Alternative. On a scale of A to F, intersections designated LOS A have the shortest delays and those designated LOS F have the longest delays and worst traffic congestion. Longer delays result in greater pollutant emissions from vehicle exhaust while the vehicles are moving slowly or idling.

A screening analysis was performed to identify intersections within the project study area that were predicted to be most affected by the project in terms of delay to vehicles passing through them. Only signalized intersections with a LOS of D, E, or F were subject to the screen. Based on the screening analysis, the following intersections have the lowest LOS score and/or highest traffic volume. These three worst-case intersections were analyzed quantitatively in a "hot spot" analysis to determine localized CO impacts. None of the three intersections are located near the four stations that are not funded by FasTracks.

- 70th Avenue and Federal Boulevard, AM Peak
- South Boulder Road and Highway 42, PM Peak
- Ken Pratt Boulevard and Hover Street, PM Peak

Direct coordination was conducted with APCD to confirm the air quality analysis approach. The emission factors in grams per mile were provided by APCD in June 2009. Emission factors were estimated for each vehicle speed evaluated in the analysis using USEPA's MOBILE6.2 model. The USEPA CAL3QHC dispersion model was used to calculate the ambient concentrations of CO at the selected worst-case intersections.

The modeled CO concentrations were added to background concentrations provided by APCD and compared with NAAQS to determine the CO hot spot impacts. If no exceedances of CO standards were modeled for the worst-case intersections, it is assumed that lower volume intersections would also pass the hot spot test.

Parking Facility CO Analysis. In addition to the CO analysis for intersections, a CO hot spot analysis was completed to analyze localized impacts from the parking facilities of the largest stations. Worst-case CO impacts would occur when large numbers of vehicles are entering and/or leaving the parking facility at the same time and when the emissions are concentrated within a relatively small area. This includes vehicles parking at the lot as well as buses transporting passengers to and from the rail station.

The stations were selected based on the parking lot size and the vehicle volume during peak hours. Of the seven stations currently funded through FasTracks program, the Downtown Longmont Station is the largest number with the highest peak hour traffic volume. Of all 11 stations proposed, the Westminster/88th Avenue Station is the largest with the highest peak hour traffic volume.

CO emissions were estimated for the these two stations in 2015 and 2035. CO emission factors for the vehicles entering and leaving the parking facilities were estimated by using the USEPA MOBILE6.2 model and were provided by APCD. CO emissions from DMU idling emissions at the stations were estimated based on the number of trains passing through these two stations during peak hours and the anticipated idling time at the stations.

The CO concentrations near the stations were modeled using the USEPA SCREEN3 air dispersion model. The maximum CO concentrations due to passenger vehicle and DMU emissions from the stations were combined with the CO background concentrations within the project study area and compared to NAAQS.

PM_{10} Hot Spot Analysis. A qualitative project-level hot spot assessment was conducted to evaluate whether the project would cause or contribute to any new localized PM_{10} violations. The analysis follows the USEPA's amendments to the Transportation Conformity Rule: "$PM_{2.5}$ and PM_{10} hot spot Analyses in Project-level Transportation Conformity Determinations for the New $PM_{2.5}$ and Existing PM_{10} National Ambient Air Quality Standards" (71 *Federal Register* 12468). The project is subject to these standards because the Denver metropolitan area is designated as maintenance for PM_{10}. The Preferred Alternative is categorized as a "new or expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location."

The analysis was based on directly emitted PM_{10} emissions from tailpipe, break wear, and tire wear. Re-entrained road dusts were not included in the analysis, assuming that the operation of DMU and vehicles would not cause significant fugitive dust emissions. Construction-related PM_{10} emissions were not required in this hot spot analysis because these emissions would be considered temporary, as construction would take place over less than 5 years (40 Code of Federal Regulations 93.123[c][5]).

In lieu of a quantitative methodology, the analysis relied on the most recent 5 years of air quality data within the project area to demonstrate that the project would not cause or contribute to a violation of the PM_{10} NAAQS.

Mobile Source Air Toxics

Air quality impacts of MSAT emissions from the DMUs within the project study area were analyzed following the Federal Highway Administration "Interim Guidance on Air Toxic Analysis for NEPA Documents" (USEPA 2006). Emissions of the six priority MSATs, including benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene were evaluated for the Preferred Alternative to demonstrate the project would not cause any significant risk exposure to the surrounding communities.

The MSAT emissions from DMU trains were obtained using the USEPA MOBILE6.2 model and the daily VMT by DMUs. Diesel particulate matter emissions were assumed to be the same as PM_{10} exhaust emissions.

Greenhouse Gas

CO_2 production is used as a surrogate for greenhouse gas emissions in this analysis. The anticipated traffic reduction due to FasTracks ridership would result in a slight decrease in future CO_2 emissions (RTD 2007), thereby minimizing the impacts of global warming.

Greenhouse gas emissions were calculated by multiplying the energy use by the CO_2 conversion factors taken from the New Starts criteria. The conversion factors are:

- Bus (compressed natural gas [CNG]) = 0.0585

- Light rail transit (LRT) and commuter rail (electric) = 0.0665
- Passenger vehicle = 0.0765
- Heavy-duty vehicle (HDV) (truck) and bus (diesel) = 0.0788
- Commuter rail (diesel) = 0.2364 (based on three engines)

Temporary Construction Impacts
The emissions of fugitive dust (PM_{10}) during the construction phase of the project was estimated by using the emission factor from the URBEMIS2007 model developed for NEPA/California Environmental Quality Act air quality impact evaluations in the state of California (URBEMIS 2007). The construction emissions would be temporary and are not anticipated to cause air quality violations. There would also be emissions from diesel-fueled construction equipment, however these would be temporary and are not anticipated to cause an air quality violation.

Indirect Impacts
Indirect impacts associated with the project operation would be associated with the shifting of the operation schedule of the existing BNSF Railway Company freight trains. It was assumed that the daily number of freight train trips within the project study area would not change during the NWR Corridor project operation. Therefore, freight train emissions are not expected to change compared to No Action Alternative. The indirect air quality impacts would be negligible

<u>Results</u>
No Action Alternative
The No Action Alternative assumes that the committed improvements described in Chapter 2.0, Alternatives Considered, would be implemented as planned by others. The No Action Alternative was used as the baseline to evaluate the air quality impacts of the Preferred Alternative.

The No Action Alternative would not have emissions from the NWR Corridor. The operation of the BNSF Railway Company freight trains would not be altered. Regional criteria pollutant emissions were evaluated for 2005, 2015, and 2035 for the No Action Alternative (Table 3.7-3). In general, annual emissions for CO, NO_X, VOC, PM_{10}, and $PM_{2.5}$ for the No Action Alternative would be similar to the emission levels of the Preferred Alternative.

The construction of the build elements on the No Action Alternative would result in fugitive dust emissions, estimated as PM_{10}. The construction emissions would be temporary and are not anticipated to cause any air quality violations.

The extent of air quality impacts for the No Action projects will be evaluated in the environmental documents being prepared for these projects.

Preferred Alternative
<u>Direct Impacts</u>
Regional Transportation Conformity
The NWR Corridor project meets the transportation conformity requirements by its inclusion in the conforming TIP and MVRTP.

Therefore, the Preferred Alternative satisfies the regional transportation conformity requirements and would not be expected to cause regional air quality impacts.

Regional and Corridor Criteria Pollutant Emissions

Regional Impacts

The Preferred Alternative would not worsen the air quality because the Preferred Alternative would have similar emissions to the No Action Alternative. The scenario including all 11 stations would result in slightly lower VMT and emissions when compared to the seven funded station scenario. The decreased VMT for the all-station scenario is likely to be related to the shorter distances the passenger vehicles drive to the additional four stations.

Regional-wide daily emissions of VOC, CO, NO_x, and PM_{10} in 2015 and 2035 for both scenarios are much lower than those in the baseline year 2005, attributed to the addition of newer vehicles with tighter emission controls, cleaner fuels, and more stringent emission restrictions in future years.

Regional criteria pollutant emissions were evaluated for 2005, 2015, and 2035 (Table 3.7-3). In general, annual emissions for CO, NO_X, VOC, PM_{10}, and $PM_{2.5}$ for the Preferred Alternative would be similar to the emission levels of the No Action Alternative baseline. The Preferred Alternative would have higher emissions in 2035 than in 2015 due to the increased VMT in the region in 2035.

TABLE 3.7-3. ANNUAL REGIONAL CRITERIA POLLUTANT EMISSIONS

	2005	2015			2035		
	Existing	No Action	Preferred Alternative (7 Stations)	Preferred Alternative (11 stations)	No Action	Preferred Alternative (7 Stations)	Preferred Alternative (11 stations)
Annual VMT (million miles/per year)							
Passenger Vehicle	20,992.5	26,280.0	26,282.1	26,278.5	37,100.0	37,097.1	37,097.5
HDV	807.6	1,056.0	1,055.6	1,056.3	1,300.7	1,302.2	1,300.9
Bus/Diesel	38.2	47.8	47.8	47.8	50.1	50.0	50.0
Bus/CNG	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Light or Heavy Rail/Electric	1.6	12.8	12.8	12.8	15.5	15.5	15.5
Commuter Rail/Diesel	0.0	0.0	1.4	1.4	0.0	2.4	2.4
Commuter Rail/Electric	0.0	6.0	6.0	6.0	6.5	6.5	6.5

TABLE 3.7-3. ANNUAL REGIONAL CRITERIA POLLUTANT EMISSIONS

	2005	2015			2035		
	Existing	No Action	Preferred Alternative (7 Stations)	Preferred Alternative (11 stations)	No Action	Preferred Alternative (7 Stations)	Preferred Alternative (11 stations)
Annual Emissions (tons/year)							
CO	444,653	398,457.9	398,498.5	398,444.9	483,231.2	483,198.3	483,203.4
NO_x	37,397	18,331.2	18,346.3	18,346.8	11,532.7	11,536.5	11,535.9
VOC	38,039	21,560.3	21,564.5	21,562.1	18,237.4	18,240.6	18,240.2
PM_{10}	970	839.6	840.1	840.1	1,085.4	1,085.8	1,085.7
$PM_{2.5}$ [2]	913	783.6	784.0	784.0	1010.0	1010.4	1010.3

Source: NWR Corridor Project Team, 2009.

Notes:

[1] A DMU or EMU train has two to four cars per train. The VMT for DMU and EMU listed in the table are car miles.

[2] $PM_{2.5}$ emissions were estimated using South Coast Air Quality Management District (SCAQMD) published $PM_{2.5}$ fraction of PM_{10} (SCAQMD, 2006).

EMU = Electric Multiple Unit
HDV = Heavy-duty Vehicle
CNG = Compressed Natural Gas
CO = Carbon Monoxide
NO^X = Nitrogen Oxides

Corridor Impacts (including Phase 1)

Table 3.7-4 presents the estimated daily VMT and emissions for the Preferred Alternative in 2015 and 2035. Emissions listed in the table were estimated using the DMU operation schedule including all 11 stations. It was assumed that the train trips and schedule change associated with the additional four stations would be minimal. Therefore, emissions in Table 3.7-4 are also representative of the emissions from the NWR Corridor with only the seven funded stations constructed.

The project would not be built under No Action Alternative, and operation of the existing freight trains would not be altered. Therefore, no emission changes would be anticipated from the continued freight rail operations of the No Action Alternative. DMU emissions in 2005 and under the No Action Alternative in 2015 and 2035 would be zero within the NWR Corridor.

Despite the higher VMT traveled by DMU in the NWR Corridor in 2035, corridor-wide daily emissions of CO, NO_x, and PM_{10} in 2035 are lower than those in the 2015 due to the tighter emission controls, cleaner fuels, and more stringent emission restrictions in future years.

TABLE 3.7-4. DAILY CORRIDOR-WIDE MILES TRAVELED AND EMISSION ESTIMATES (DMU ONLY)

Pollutant	2015 Total Preferred Alternative	2035 Total Preferred Alternative
	VMT/day	**VMT/day**
	2764	4294
	pounds/day	**pounds/day**
CO	65.62	27.00
VOC	19.53	24.98
NO_x	124.47	27.53
PM_{10}	4.13	3.10
$PM_{2.5}$	2.89	1.44

Source: NWR Corridor Project Team, 2009.

CO Hot Spot Analysis

The analytical results indicated that the project operation would not cause a CO hot spot impact in the future years. Six intersections showed a LOS of D or worse for the No Action Alternative and Preferred Alternative. A screening procedure based on traffic volumes and level of congestion was used to select three worst-case intersections. If no exceedances of CO standards are modeled for the worst-case intersections, it was assumed that lower volume intersections would also pass the hot spot test.

Tables 3.7-5 and 3.7-6 summarize the CAL3QHC modeling results for CO under the current conditions, the No Action Alternative, and the Preferred Alternative. The concentrations presented in the tables include background values provided by APCD. 1-hour and 8-hour CO concentrations were provided for each intersection and analysis year.

TABLE 3.7-5. MAXIMUM 1-HOUR CARBON MONOXIDE CONCENTRATIONS AT HOT SPOT INTERSECTIONS

Scenario	Concentration (ppm)[1]		
	70th Avenue/ Federal Boulevard	South Boulder Road/ State Highway 42	Ken Pratt Boulevard/ Hover Road
NAAQS	35	35	35
2005[1] – Existing	7.17	8.94	7.71
2015 – No Action	5.48	6.33	4.74
2015 – Preferred Alternative	5.68	6.53	4.74
2035 – No Action	5.64	6.66	4.95
2035 – Preferred Alternative	5.64	6.66	4.95

Source: NWR Corridor Project Team, 2009.
Notes:
[1] Includes background concentrations provided by APCD

TABLE 3.7-6. MAXIMUM 8-HOUR CARBON MONOXIDE CONCENTRATIONS AT HOT SPOT INTERSECTIONS

Scenario	Concentration (ppm)[1]		
	70th Avenue/ Federal Boulevard	South Boulder Road/ State Highway 42	Ken Pratt Boulevard/ Hover Road
NAAQS	9	9	9
2005[1] – Existing	4.90	6.08	4.93
2015 – No Action	3.74	4.26	2.91
2015 – Preferred Alternative	3.88	4.40	2.91
2035 – No Action	3.85	4.51	3.09
2035 – Preferred Alternative	3.85	4.51	3.09

Source: NWR Corridor Project Team, 2009.
Notes:
[1] Includes background concentrations provided by APCD
ppm = parts per million

Modeled concentrations at all intersections are below the 1-hour and 8-hour NAAQS of 35 ppm and 9 ppm, respectively for all years and alternatives analyzed. The 70th Avenue/ Federal Boulevard and South Boulder Road/State Highway 42 intersections would have slightly higher CO concentrations from the Preferred Alternative than the No Action Alternative because there would be greater peak-hour vehicle volumes at these intersections for the Preferred Alternative.

Based on the results of the CO analysis, the Preferred Alternative would not contribute to a violation of the CO standards.

Parking Facility CO Analysis

The summary of the total CO emissions at the stations with the most parking and highest traffic for the years 2015 and 2035 is presented in Table 3.7-7. The majority of the CO emissions would be from passenger vehicles traveling to and from the parking facility of each station.

TABLE 3.7-7. AUTOMOBILE AND BUSES CARBON MONOXIDE EMISSIONS AT THE LARGEST STATIONS

Year	Largest Stations	Passenger Vehicles (pounds/ hour)	Bus (pounds/ hour)	Diesel Multiple Unit (pounds/ hour)	Total (pounds/ hour)
2015	Downtown Longmont	5.40	0.287	0.0394	5.72
	Westminster/88th Avenue	5.55	0.347	0.0394	5.94
2035	Downtown Longmont	4.46	0.072	0.0101	4.54
	Westminster/88th Avenue	4.59	0.086	0.0101	4.69

Source: NWR Corridor Project Team, 2009.

The maximum CO concentrations due to passenger vehicle and DMU exhaust were combined with the CO background concentration and compared with the NAAQS. As shown in Table 3.7-8, the maximum 1-hour CO concentrations in the vicinity of the station would be well below the NAAQS of 35 ppm at both stations. The maximum 8-hour modeled concentrations are also predicted to be below the NAAQS of 9 ppm.

TABLE 3.7-8. MAXIMUM PREDICTED CARBON MONOXIDE CONCENTRATIONS

Year	Worst-case Stations	Averaging Time[1]	Maximum CO Concentration Increase (ppm)	Maximum Monitored CO Concentration (ppm)	Total CO Concentration (ppm)	NAAQS (ppm)
2015	Downtown Longmont	1-hour	0.633	5.9	**6.5**	35
	Westminster/88th Avenue	8- hour	0.443	3.1	**3.5**	9
2035	Downtown Longmont	1- hour	0.522	5.9	**6.4**	35
	Westminster /88th Avenue	8- hour	0.365	3.1	**3.5**	9

Source: NWR Corridor Project Team, 2009.
Notes:
[1] 1-hour and 8-hour background concentrations of 5.9 ppm and 3.1 ppm, were from 2105 Broadway-CAMP monitoring station, 2006 to 2008 data.

Because the Downtown Longmont and Westminster/88th Avenue stations are the two largest for the funded stations and all 11 stations, respectively, the CO analysis results presented here would represent the worst-case CO impacts of the project. Therefore, the CO concentration increases at all stations would not be expected to cause any violation of the 1-hour or 8-hour CO NAAQS.

PM_{10} Hot Spot Analysis

Both the seven stations scenario and the 11 stations scenario under the Preferred Alternative would result in small increase of PM_{10} emissions when compared to the No Action Alternative. However, corridor-wide PM_{10} emissions are expected to decrease in future years. Table 3.7-4 shows the decrease of corridor-wide PM_{10} emissions in 2035 when compared to 2015, despite the VMT increase in 2035.

Fugitive dust re-entrained by vehicles may also cause PM_{10} hot spots. According to the emission calculation methodology described in Chapter 13.2.1 of AP-42, *Fifth Edition, Compilation of Air Pollutant Emission Factors* (USEPA 2006), road re-entrained dust emissions are a function of the road silt content, average weight of vehicles travel on the road, and VMT. Because the project would not significantly change the vehicle mix and VMT within the project area, road re-entrained dust would not be anticipated to increase and cause any new violations of the PM_{10} NAAQS.

To demonstrate that the PM_{10} emission increase within the corridor of the Preferred Alternative would not cause any violation of the NAAQS, three years of ambient PM_{10} data measured near the project study area are presented in Table 3.7-2, Summary of Ambient Monitoring Levels for Monitoring Stations in the Study Area. The monitoring data indicated that there have been no violations of the 24-hour federal PM_{10} standard during the last 3 years for the Denver metropolitan area. A violation would be recorded at a particular monitor if more than one measured 24-hour value equals or exceeds the NAAQS during a calendar year. Therefore, the highest measured value is disregarded and the next highest value (the “high 2nd-high”) is compared to the NAAQS.

The high 2nd-high 24-hour PM_{10} concentrations measured at the four monitoring stations within the project area (Longmont, Boulder, Welby, and CAMP stations) were, at most, 32 percent, 39 percent, 63 percent, and 43 percent, respectively of the federal 24-hour standard of 150 milligrams per meter cubed.

Hot spots of PM_{10} would most likely occur where large volumes of traffic operate under heavily congested conditions. The maximum VMT increase within the NWR Corridor is in 2035. Unlike other vehicles that may cause congestions under certain circumstances, DMU trains would be traveling on tracks following a strict operation schedule. DMU trains would not be congested to cause PM_{10} emissions cumulating at one location.

Based on the DMU operations and the low background concentration of PM_{10} in the project study area, the Preferred Alternative would not be expected to cause any violation of the PM_{10} NAAQS.

Mobile Source Air Toxics

Total emissions within the project study area for the priority MSATs were estimated for the project including all 11 stations. Emissions were estimated for the years 2015 and 2035. Year 2005 emissions were examined to identify current VMT levels and the degree of pollution control on the current mix of vehicles. Corridor-wide MSAT emissions were estimated using the same methodology as for criteria pollutants.

Table 3.7-9 presents the estimated daily MSAT emissions for the Preferred Alternative. Given that DMU trains do not currently operate in the NWR Corridor, introduction of the DMU technology would create an increase in MSAT emissions over existing conditions. Therefore, corridor-wide MSAT emissions would have increases when compared to the existing condition and the No Action Alternative.

TABLE 3.7-9. DAILY CORRIDOR-WIDE EMISSION ESTIMATES (PRIORITY MOBILE SOURCE AIR TOXICS)

Pollutants	Preferred Alternative 2015 Total (pounds/day)	Preferred Alternative 2035 Total (pounds/day)
Benzene	0.21	0.28
1,3 Butadiene	0.12	0.16
Formaldehyde	1.60	2.05
Acetaldehyde	0.59	0.75
Acrolein	0.07	0.09
Diesel PM	2.64	0.79

Source: NWR Corridor Project Team, 2009.

Greenhouse Gas Emissions

In this analysis, CO_2 production is used as a surrogate for greenhouse gas emissions. CO_2 emission data presented below included the direct emissions from regional vehicle travel, DMU train operations, as well as those from the power generation facility that generate electricity required for the electric rail operation for Phase 1.

The anticipated traffic reduction due to FasTracks ridership (system-wide) would result in a slight decrease in future CO_2 emissions (RTD 2007), therefore reducing the impacts of global warming.

Table 3.7-10 shows that in both 2015 and 2035, by itself the Preferred Alternative would produce more CO_2 compared to the No Action Alternative. However, the increase associated with the Preferred Alternative is negligible and would be off-set by the traffic reduction and associated lower CO_2 emissions resulting from the FasTracks system ridership as a whole.

TABLE 3.7-10. CARBON DIOXIDE PRODUCED, 2015 AND 2035 (MILLION TONS PER YEAR)

		2015			2035		
	2005	No Action Alternative	Preferred Alternative (FasTracks Stations only)	Preferred Alternative (All Stations)	No Action Alternative	Preferred Alternative (FasTracks Stations only)	Preferred Alternative (All Stations)
CO_2 Produced	11,547,044	14,626,989	14,649,802	14,649,276	20,236,533	20,274,613	20,272,568
Difference from No Action Alternative	N/A	N/A	22,813	22,287	N/A	38,080	36,035
Percent Difference	N/A	N/A	0.16%	0.15%	N/A	0.19%	0.18%

Source: RTD, 2008.

Phase 1

Implementation of Phase 1 of the NWR Corridor between DUS and South Westminster/71st Avenue Station would not cause any regional air quality impacts for criteria pollutants. Phase 1 was analyzed as a component of the Preferred Alternative, assuming DMU technology as a worst case scenario. Given that Phase 1 is a component of the Preferred Alternative and Phase 1 would be initially implemented with electric multiple unit (EMU) technology, impacts are assumed to be the same as the Preferred Alternative. Analysis demonstrated the project is in compliance with the regional transportation conformity requirements and would not cause any regional air quality impacts for criteria pollutants. Additionally, the MSAT analysis and CO hot spot analysis demonstrated comparable emissions to the No Action Alternative and no anticipated PM_{10} or CO violations of the NAAQS.

Indirect Impacts

The Preferred Alternative would have no indirect impacts.

Temporary Construction Impacts

The fugitive dust emissions (estimated as PM_{10}) associated with construction of the proposed project would be 100 pounds per day, based on the assumption that the maximum disturbed area would be 10 acres per day. There would also be emissions associated with diesel fueled equipment used for construction activities. The construction emissions would be temporary and are not anticipated to cause any air quality violations.

3.7.1.4 Mitigation Measures

No violations of air quality standards are anticipated to result from the operations of the Preferred Alternative; therefore the mitigation presented in Table 3.7-11 focuses on temporary construction impacts.

TABLE 3.7-11. MITIGATION MEASURES FOR AIR QUALITY UNDER THE PREFERRED ALTERNATIVE

Impact	Impact Type	Mitigation Measures for the Preferred Alternative
Air emissions	Construction	• For winter construction, the contractor shall install engine pre-heater devices to eliminate unnecessary idling. • The contractor shall be prohibited from tampering with equipment to increase horsepower or to defeat emissions control device effectiveness. • Construction vehicles and equipment used by the contractor shall be properly tuned and maintained. • Construction vehicles and equipment used by the contractor shall be equipped with the minimum practical engine size for the intended job requirement. • All construction equipment used by the contractor will be equipped to burn ultra low sulfur diesel fuel. • The contractor shall use water or wetting agents to manage dust. • The contractor shall use wind barriers and wind screens to minimize the spreading of dust in areas where large amounts of materials are stored. • The contractor shall use a wheel wash station and/or large-diameter cobble apron at egress/ingress areas to minimize dirt being tracked onto public streets. • The contractor shall use vacuum powered street sweepers to control dirt tracked onto streets. • The contractor shall cover all dump trucks leaving the site. • The contractor shall cover or wet temporary excavated materials. • The contractor shall use a binding agent for long-term excavated materials.

Source: NWR Corridor Project Team, 2009.

3.7.2 Energy

3.7.2.1 Introduction to Analysis

Summary of Results

The Preferred Alternative would result in 0.0005 percent more regional energy usage than the No Action Alternative in both 2015 and 2035. This represents 90,481,000 British thermal units (Btu) consumed annually in 2015 and 143,392,000 Btus consumed annually in 2035. By 2035, the Preferred Alternative would result in a regional reduction of 2.4 million passenger VMT per year and a total regional reduction of 0.1 million VMT per day. Both the Preferred Alternative and the No Action Alternative would result in energy usage during construction.

Purpose

RTD's Sustainability Policy promotes sustainability within FasTracks and the RTD district. The reduction of energy usage, efficient use of non-renewable resources, and a decreasing reliance on fossil fuels are important objectives of the program (RTD 2008).

3.7.2.2 Affected Environment

Energy sources for transportation are most commonly petroleum fuels for automobiles, trucks, buses, and trains, and electricity for electrified transit. Currently, approximately

90 percent of RTD buses operate on diesel fuel and 10 percent on compressed natural gas (CNG). The existing transit system does not currently include any commuter rail facilities. The current light rail transit fleet operates on electrical power purchased from Xcel Energy (Xcel).

Xcel currently operates 11 power plants in Colorado that are supplemented by several wind farms and 6 hydroelectric facilities. Throughout its eight-state operating region, Xcel produces approximately 75 percent of its own power and purchases the other 25 percent through long- and short-term contracts with other energy companies (Xcel 2009).

3.7.2.3 Impact Evaluation

Methodology

This section evaluates the differences in regional energy consumption between the No Action Alternative and the Preferred Alternative based on traffic and ridership projections for 2015 and 2035. The evaluation is based on the following assumptions:

- The forecast year is 2035.
- VMT estimates were based on DRCOG regional travel demand model.
- The project study area consists of the regional transportation network modeled for air quality and travel demand purposes.
- Regional energy consumption in Btu was based on estimated changes in VMT per FTA guidance as presented in *Reporting Instructions for the Section 5309 New Starts Criteria* (FTA 2001).

The corridor VMT was separated into passenger miles, heavy truck miles, and bus miles to account for differences in energy consumption levels. The Btu from each category of VMT is as follows:

- One passenger vehicle mile = 6,233 Btu
- One heavy-duty vehicle (truck) mile = 22,046 Btu
- One diesel or CNG bus mile = 41,655 Btu
- One LRT mile = 77,739 Btu
- One commuter rail (diesel) mile = 66,138 Btu
- One commuter rail (electric) mile = 95,000 Btu

RTD will be constructing this project in phases. Phase 1 includes construction from DUS to the South Westminster/71st Avenue Station (approximately Bradburn Boulevard). Phase 1 would be constructed as a component of RTD's Eagle P3 project. Because the analysis is based on regional travel demand modeling, energy consumption is calculated for the No Action Alternative and Preferred Alternative overall and is not broken out in Phases.

Results

No Action Alternative

Direct, Indirect, Temporary Construction, and Cumulative Impacts

Table 3.7-12 illustrates the differences in VMT between the No Action Alternative and the Preferred Alternative in 2015. While the Preferred Alternative would result in a regional reduction of 1.4 million VMT per year for passenger vehicles, there would be an overall increase of 0.3 million VMT per year for all modes.

TABLE 3.7-12. ANNUAL REGIONAL VEHICLES MILES TRAVELED, 2015

Vehicle	No Action Alternative (million miles per year)	Preferred Alternative All Stations (million miles per year)	Difference (million miles per year)
Passenger Vehicles (LDV/LDT)	26,279.9	26,278.5	(1.4)
Commercial Trucks (HDV)	1,056.0	1,056.3	0.3
Bus (Diesel)	47.8	47.8	0.0
Bus (CNG)	0.3	0.3	0.0
Light Rail	12.8	12.8	0.0
Commuter Rail (Diesel)	NA	1.4	1.4
Commuter Rail (Electric)	5.9	5.9	0.0
Total	**27,402.7**	**27,403.0**	**0.3**

Source: NWR Corridor Project Team, 2009.

Notes:
LDV = Light Duty Vehicle
LDT = Light Duty Truck

Table 3.7-13 illustrates the differences in VMT between the No Action Alternative and the Preferred Alternative in 2035. The Preferred Alternative would result in a regional reduction of 2.4 million VMT per year for passenger vehicles, and a total regional reduction of 0.1 million VMT per day for all modes; showing an improvement in 2035 when compared to 2015.

TABLE 3.7-13. ANNUAL REGIONAL VEHICLE MILES TRAVELED, 2035

Vehicle	No Action Alternative (million miles per year)	Preferred Alternative All Stations (million miles per year)	Difference (million miles per year)
Passenger Vehicles (LDV/LDT)	37,100	37,097.5	(2.4)
Commercial Trucks (HDV)	1,300.7	1,300.9	0.2
Bus (Diesel)	50.1	50.0	(0.1)
Bus (CNG)	0.3	0.3	0.0
Light Rail	15.5	15.5	0.0
Commuter Rail (Diesel)	NA	2.4	2.4
Commuter Rail (Electric)	6.5	6.5	0.0
Total	**38,473.0**	**38,473.1**	**(0.1)**

Source: NWR Corridor Project Team, 2009.

In both 2015 and 2035, the No Action Alternative would consume slightly less energy than the Preferred Alternative (Tables 3.7-14 and 3.7-15). It is important to note that even though the No Action Alternative excludes the additional VMT traveled by DMU in the NWR Corridor, energy usage would be only 0.0005 percent less than under the Preferred Alternative.

TABLE 3.7-14. ENERGY CONSUMED FOR THE NO ACTION AND PREFERRED ALTERNATIVES, 2015

Vehicle	No Action Alternative Btus Consumed (millions)	Preferred Alternative Btus Consumed (millions)
Passenger Vehicles (LDV/LDT)	163,802,617	163,793,891
Commercial Trucks (HDV)	23,280,576	23,287,190
Bus (Diesel)	1,991,109	1,991,109
Bus (CNG)	12,497	12,497
Light Rail	995,059	995,059
Commuter Rail (Diesel)	NA	92,593
Commuter Rail (Electric)	560,500	560,500
Total	**190,642,358**	**190,732,839**
Difference in Btu Between the No Action and Preferred Alternatives	NA	90,481
Percent change in energy use	NA	0.0005

Source: NWR Corridor Project Team, 2009.

TABLE 3.7-15. ENERGY CONSUMED FOR THE NO ACTION AND PREFERRED ALTERNATIVES, 2035

Vehicle	No Action Alternative Btus Consumed (millions)	Preferred Alternative Btus Consumed (millions)
Passenger Vehicles (LDV/LDT)	231,244,300	231,228,718
Commercial Trucks (HDV)	28,675,232	28,679,641
Bus (Diesel)	2,086,916	2,082,750
Bus (CNG)	12,497	12,497
Light Rail	1,204,955	1,204,955
Commuter Rail (Diesel)	0	158,731
Commuter Rail (Electric)	617,500	617,500
Total	**263,841,400**	**263,984,792**
Difference in Btu Between the No Action and Preferred Alternatives	NA	143,392
Percent change in energy use	NA	0.0005

Source: NWR Corridor Project Team, 2009.

Roadway and transit projects included in the No Action Alternative would result in additional demand for energy. Energy would also be required for the construction of these projects. The amount of energy that would be needed to accommodate growth and development within the project study area and the amount of energy required for the construction of the No Action Alternative will be evaluated in the environmental documents being prepared for these projects.

As stated in the *Programmatic Cumulative Effects Analysis* (RTD 2007), without the implementation of FasTracks, the overall annual Btus for the region would be 201,034,575.

The total annual VMT for the region without FasTracks would be 32,656,127. Total Btus and VMT would be higher without FasTracks than with FasTracks.

Preferred Alternative

Direct Impacts

NWR Corridor Alignment and Proposed Stations

As discussed previously, the Preferred Alternative is expected to result in slightly more regional energy consumption than the No Action Alternative. There would be an increase in energy consumption of 90,481 million Btu and 143,392 million Btu in 2015 and 2035, respectively, or a negligible increase of 0.0005 percent, compared to the No Action Alternative (Tables 3.7-14 and 3.7-15), almost entirely due to the commuter rail system, while passenger vehicle energy usage decreases.

Phase 1

The Eagle P3 project includes EMU technology for the Gold Line and East Corridor projects. As a result, the Phase 1 Alignment would be electrified from DUS to the South Westminster/ 71st Avenue Station. The difference in technology would still result in a negligible increase in regional energy usage when compared to the No Action Alternative.

Indirect Impacts

Indirect impacts associated with the Preferred Alternative are generally the result of increased density and redevelopment surrounding transit stations. The regional energy requirements to serve this population under the Preferred Alternative may be slightly less than for the No Action Alternative because of smaller residences in redeveloped neighborhoods, decreased dependence on automobiles, and increase in transit use.

For the Phase 1 segment of the project that utilizes EMU technology, electricity would come from a grid and the power used for the Preferred Alternative would likely come from a continually shifting network of coal plants, gas plants, wind farms, or even nuclear power plants. It was assumed that the Preferred Alternative's power needs would not require additional power generation capacity; therefore, no additional adverse air quality impacts are expected from the power plants whose air quality impacts have already been evaluated via their respective air quality permits. For this reason, indirect emissions associated with power plant operation are expected to be minimal and are not discussed further.

Temporary Construction Impacts

Energy used for construction activities is generally in the form of fossil fuels for construction equipment. During the 5-year construction period, approximately 990,080 million Btus would be consumed for the construction of the Preferred Alternative. Approximately 17 percent of this (169,844 Btus) would be for the construction of Phase 1.

Cumulative Impacts

The implementation of the Preferred Alternative and the No Action Alternative would result in comparable regional energy consumption. The projected modest density increases surrounding the proposed stations may result in smaller average home sizes and more efficient use of public infrastructure. Both of these effects would help to reverse the past trends of energy consumption increasing faster than population. Although the Preferred Alternative would result in a negligible increase in energy over the No Action Alternative, as stated in the *Programmatic Cumulative Effects Analysis* (RTD 2007), the entire FasTracks Plan would result in an overall energy reduction of 116,233,392 Btus/year (RTD 2007).

Avoidance and Minimization Measures

Energy usage can be minimized through efficient design and the implementation of best management practices (BMP) during construction (see Table 3.7-16). Project benefits such as reduction of congestion, improved travel time, and improvements in level of service would reduce the regional expenditure of energy over time.

3.7.2.4 Mitigation Measures

Mitigation techniques to reduce identified impacts to energy usage are described in Table 3.7-16.

TABLE 3.7-16. PROPOSED MITIGATION MEASURES - ENERGY

Impact	Impact Type	Mitigation Measures
Use of energy resources during construction and operations	Construction and Operations	• BMPs to reduce energy usage during construction could include: - Locating materials onsite or within close proximity to the project site. - Using newer, more energy efficient construction vehicles. - Programs to encourage construction workers to carpool or use public transportation for travel to and from the construction site. • Design efforts to reduce energy consumption and overall VMT could include: - Creating multiple access points for parking lots, where possible. - Carefully designing “kiss-n-ride” drop-offs to maximize efficiency and minimize number of idling vehicles. - Positioning stations to be more easily acceptable by pedestrians and bicyclists. - Design park-n-Ride improvements to decrease energy usage consistent with RTD’s sustainability policy.

Source: NWR Corridor Project Team, 2009.