3.7 Air Quality and Greenhouse Gases

This section describes the impacts on air quality and greenhouse gas (GHG) emissions that could result from construction and operation of the proposed rail line. Air quality is a concern because of the demonstrated effects of air pollutant emissions on human health. GHG emissions are a concern because of their contributions to global climate change. The subsections that follow describe the study area, data sources, OEA's analysis methods, the affected environment, and the potential environmental impacts of the proposed rail line.

3.7.1 Analysis Methods

This subsection identifies the study area, data sources, and analysis methods that OEA used to analyze impacts on air quality and GHG emissions.

3.7.1.1 Study Area

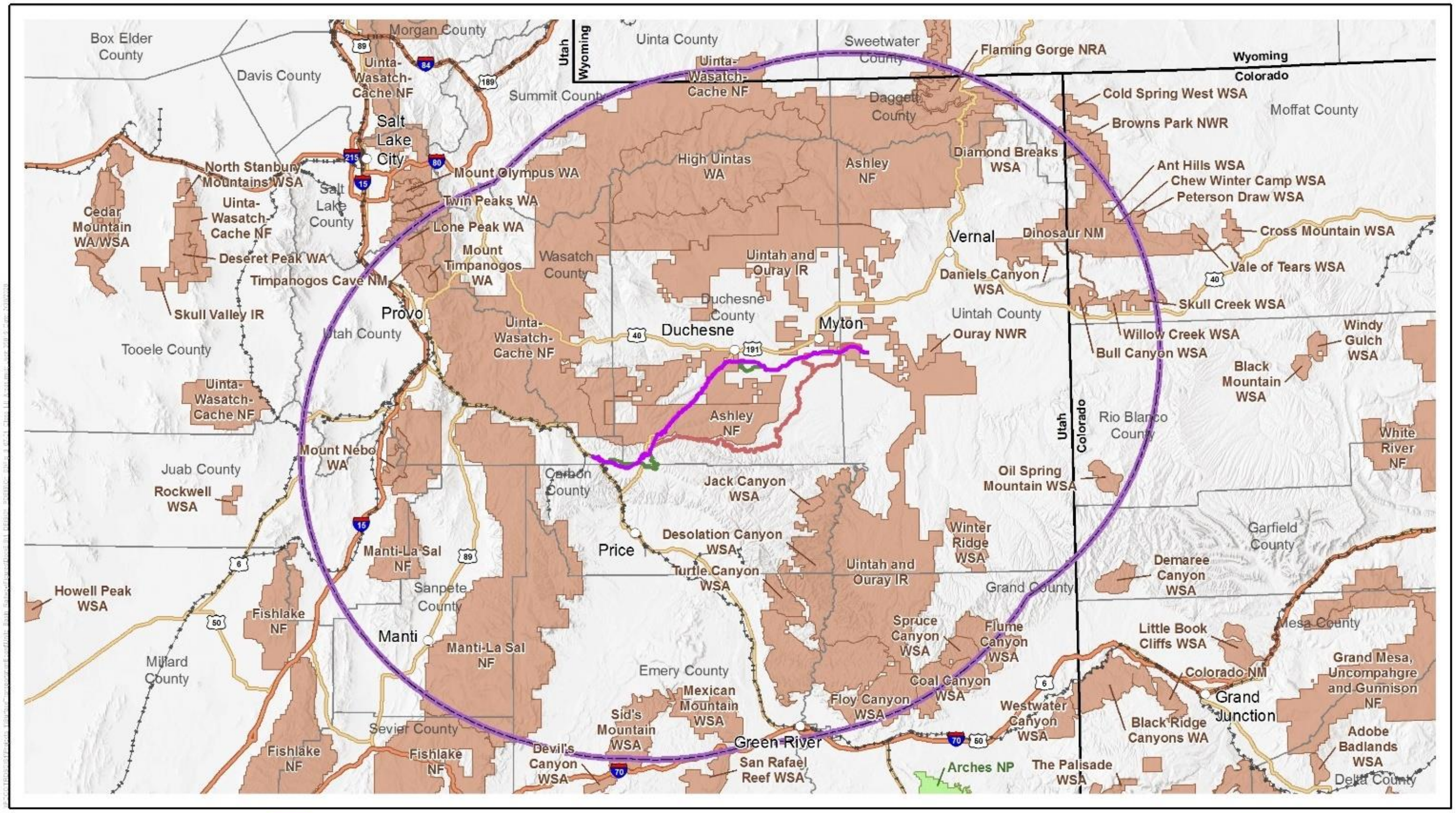
The study area for the air quality analysis includes a local study area, regional study area, and a downline impacts study area. The study area for GHG emissions is the global atmosphere because climate change is a global phenomenon.

- **Local study area.** The study area for local air quality includes an area extending generally 1,000 feet on either side of the centerline of each Action Alternative. OEA increased the size of the study area in some locations, however, to account for localized differences in factors that could affect air quality, such as local topography and certain design features of the proposed rail line. ~~The local air quality study area also includes existing rail lines between the proposed rail connection near Kyune, Utah, and the boundaries of the Denver Metro/North Front Range air quality nonattainment area that could experience an increase in rail traffic if the proposed rail line were constructed, as described in Section 3.1, *Vehicle Safety and Delay*.~~
- **Regional study area.** The study area for regional air quality includes the area within 100 kilometers (62 miles) of the proposed rail line as shown in Figure 3.7-1. It is located in the Wasatch Front Air Quality Control Region and the Utah Intrastate Air Quality Control Region in Utah, as designated by the U.S. Environmental Protection Agency (USEPA). The eastern edge of the regional study area also extends about 18 miles into the Yampa Intrastate Air Quality Control Region in Colorado. Within the regional air quality study area, OEA considered air quality related values (AQRVs), which are resources that could be adversely affected by a change in air quality, such as visibility[1] and acidic deposition.[2]

[1] Visibility impairment or haze is caused when sunlight encounters tiny pollution particles in the atmosphere and is either absorbed or scattered, which reduces the clarity and color of what can be seen. Deciviews or standard visual range are terms used to express visibility.

[2] Acidic deposition occurs when nitrates and sulfates formed in the atmosphere are deposited to soil, vegetation, and surface water. Acid deposition to lakes can impair water quality by reducing their acid-neutralizing capacity.

Figure 3.7-1. Air Quality Regional Study Area



— Indian Canyon Alternative
— Wells Draw Alternative
— Whitmore Park Alternative
Existing Rail Line
Air Quality Study Area
Class I Area
Class II Area

List of Abbreviations
IR - Indian Reservation
NF - National Forest
NM - National Monument
NP - National Park
NRA - National Recreation Area
NWR - National Wildlife Refuge
WA - Wilderness Area
WSA - Wilderness Study Area

Source: FLAG 2010.

N
0 10 20 Miles

- **Downline study area.** The study area for downline air quality includes segments of existing rail lines outside of the Basin that could experience an increase in rail traffic above OEA's thresholds at 49 C.F.R. § 1105.7(e)(5) if the proposed rail line were constructed. As described in Section 3.1, *Vehicle Safety and Delay*, the downline study area extends from the proposed connection near Kyune to the northern, eastern, and southern edges of the Denver Metro/North Front Range air quality nonattainment area (Appendix C, *Downline Analysis Study Area and Train Characteristics*, Figure C-1).

There are no federal Class I[3] air quality areas within 100 kilometers of the proposed rail line, although there are Class II air quality areas in the study area. The study area includes part of Dinosaur National Monument, the Colorado portion of which is designated by the Colorado Department of Public Health and Environment as a state-level Class I area for sulfur dioxide (SO_2).

3.7.1.2 Data Sources

OEA reviewed the following data sources to determine the potential impacts on air quality and GHGs that could result from construction and operation of the proposed rail line.

- Ambient air quality information as measured by Utah Department of Environmental Quality (Utah DEQ) and USEPA.
- Information on existing emissions sources in the region (from Utah DEQ and USEPA).
- Information on oil and gas development in the region obtained from public sources and agency consultation.
- Information on truck traffic in the region obtained from public sources and agency consultation.
- Data on meteorology and climate in the region.
- Information on anticipated construction and operation activities provided by the Coalition.
- Standard air pollutant emissions rates for anticipated project-related construction and operation activities, such as for operation of locomotives, from USEPA.

3.7.1.3 Analysis Methods

OEA used the following methods to evaluate the impacts of air pollutant emissions, including GHG emissions, related to construction and operation of the proposed rail line.

- **OEA identified and characterized the emissions sources.** OEA reviewed information provided by the Coalition about the Coalition's plans for rail construction and operation to identify sources of air pollutant and GHG emissions. The emissions sources included equipment and vehicles that construction contractors would use during rail construction, as well as the locomotives that would pull the trains on the proposed rail line during rail operations, among other sources.

[3] Class I air quality areas, as defined by the Clean Air Act, include national parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that existed or were authorized as of August 7, 1977. Class I areas are areas of special national or regional natural, scenic, recreational, or historic value, and this category allows for very little degradation in air quality, whereas Class II areas allow for reasonable industrial/economic expansion.

- **OEA estimated total emissions related to rail construction and operation.** OEA calculated the emissions from each emissions source and aggregated them to estimate total emissions for rail line construction and total emissions per year for rail line operation for each air pollutant. OEA used the following references, methods, data, and models to estimate emissions.
  - The USEPA MOVES2014b (USEPA 2019a) model to estimate emissions rates from construction equipment and vehicles and from motor vehicles traveling on roads.
  - USEPA (2009) guidance to estimate exhaust emissions rates from locomotives. USEPA emissions standards for locomotives have become more restrictive over time. The emissions averaged over all locomotives in a fleet will therefore decrease over time as newer locomotives subject to lower (more restrictive) emissions standards enter the fleet and older locomotives are retired.
  - Western Region Air Partnership (2006) guidance and the USEPA AP-42 emissions factor compilation (USEPA 1998a, 1998b, 2006) to estimate emissions of fugitive[4] particulate matter from earthmoving and exposed earth surfaces.
- **OEA modeled the concentration and deposition of air pollutants.** OEA used the USEPA AERMOD dispersion model (USEPA 2019b) to estimate the concentrations of airborne pollutants that could result from the operation of the proposed rail line. Concentrations of air pollutants are important for characterizing potential air quality impacts. OEA used the estimated emissions rates and meteorological data for the regional study area as inputs into the dispersion model. Appendix M, *Air Quality Emissions and Modeling Data*, contains further details on the modeling.
- **OEA compared air pollutant and GHG emissions from rail construction and operation to existing emissions in the study areas.** OEA compared the increases in emissions of criteria pollutants,[5] hazardous air pollutants, and GHGs that would result from construction and operation of the proposed rail line with existing emissions levels in the regional study area and the state of Utah. OEA also compared the estimated concentrations of criteria pollutants to the applicable standards and thresholds.

3.7.2 Affected Environment

This subsection identifies the existing environmental conditions related to air quality and climate in the study areas. OEA relied on current air quality and climate information regarding the Uinta Basin (Basin) region for existing conditions. The Basin is a rural area of northeastern Utah where the majority of the state's oil and gas production occurs. The regional study area accounts for more than 90 percent of the state's criteria pollutant emissions from the oil and gas sector (Utah DEQ 2020).

3.7.2.1 Existing Emissions in the Region

Table 3.7-1 shows the total emissions of each pollutant in the regional study area and statewide.

[4] Fugitive emissions are emissions that are not emitted from a stack, vent, or other specific point that controls the discharge. For example, windblown dust is fugitive particulate matter.

[5] The criteria air pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

Table 3.7-1. Existing Emissions in the Regional Study Area and Utah Statewide

	Emissions[a] in 2014[b]		
Pollutant	Regional Study Area[c]	Utah Statewide	Regional Study Area Percent of State
Criteria Pollutants (U.S. tons/year)			
Carbon monoxide	152,372	657,617	23
Nitrogen oxides	61,911	181,844	34
PM10	54,500	186,074	29
PM2.5	10,708	39,643	27
Sulfur dioxide	17,204	26,964	64
Volatile organic compounds	286,281	957,968	30
Lead	1.18	8.33	14
Hazardous Air Pollutants (U.S. tons/year)			
1,3-Butadiene	63	305	21
Acetaldehyde	4,063	18,115	22
Acrolein	66	305	22
Benzene	1,238	2,481	50
DPM[d]	859	3,712	23
Ethylbenzene	360	1,028	35
Formaldehyde	5,710	25,496	22
Napthalene	77	359	21
POM (as PAH)	6.54	6.57	99
Greenhouse Gases (metric tons/year)			
Carbon dioxide	4,406,531	20,427,325	22
Methane	1,060	5,066	21
Nitrous oxide	120	546	22
CO_2e[e] (100-year GWP)	4,468,836	20,716,546	22
CO_2e[e] (20-year GWP)	4,517,531	20,949,871	22

Notes:

[a] Emissions are rounded to the nearest ton, except lead and POM emissions, which are rounded to the nearest 0.01 ton.

[b] 2014 is the most recent year for which complete data are available.

[c] Emissions data are available at the county level. OEA compiled air quality data for the eight-county area consisting of Carbon, Daggett, Duchesne, Emery, Sanpete, Uintah, Utah, and Wasatch Counties. OEA selected these counties because they correspond most closely to the regional air quality study area. These differ from the seven counties of the Coalition (Carbon, Daggett, Duchesne, Emery, San Juan, Sevier, and Uintah Counties).

[d] DPM values include PM10 emissions in all USEPA National Emissions Inventory mobile source sectors that specify use of diesel fuel.

[e] CO_2e values were calculated using the ~~100-year potential~~ GWP values from IPCC 4th Assessment Report (IPCC 2007). 100-year GWP values are: carbon dioxide = 1; methane = 25; nitrous oxide = 298. 20-year GWP values are: carbon dioxide = 1; methane = 72; nitrous oxide = 289.

Sources: U.S. Environmental Protection Agency 2014; IPCC 2007

PAH = polyaromatic hydrocarbons; PM10 = particulate matter 10 microns or less in diameter; PM2.5 = particulate matter 2.5 microns or less in diameter; DPM = diesel particulate matter; POM = polycyclic organic matter; CO_2e = carbon dioxide equivalent; GWP = global warming potential

Within the regional study area, the largest contributions of criteria pollutant emissions by sector are as follows (Utah DEQ 2020).

- Point sources (e.g., power plants) account for about 39 percent of emissions of nitrogen oxides (NO_X) ~~emissions~~ and about 96 percent of SO_2 emissions in the regional study area.
- Area sources (smaller, widespread sources as well as fugitive dust) account for about 88 percent and 74 percent of emissions of particulate matter with diameter equal to or less than 10 microns (PM10) and 2.5 microns (PM2.5), respectively, and 78 percent of volatile organic compound (VOC) emissions in the regional study area.
- Mobile sources account for about 47 percent of carbon monoxide (CO) emissions and 33 percent of NO_X emissions in the regional study area.
- The oil and gas sector accounts for about 20 percent of NO_X emissions and 19 percent of VOC emissions in the regional study area.

3.7.2.2 Regional Meteorology

The Basin is the most northerly portion of the Colorado Plateau, at an elevation of predominately 5,000 to 10,000 feet above sea level. Because of this elevation, the average temperatures tend to be lower than at lower elevations. The Basin is considered to have a semi-arid, mid-continental climate. The mountain ranges in the western United States alter the prevailing westerly air currents from the Pacific region by forcing the moist air to rise and drop much of its moisture as precipitation. As a result, the prevailing winds reaching Utah are comparatively dry, and there is relatively little precipitation in the Basin (WRCC 2020a). Table 3.7-2 summarizes representative meteorological data measured at locations from west to east in the local study area.

Table 3.7-2. Representative Meteorological Data in the Local Study Area

Description	Price	Nutters Ranch[a]	Duchesne	Myton
Average max. temperature (°F)	63.7	62.1	60.3	62.0
Average min. temperature (°F)	36.1	30.2	30.0	30.3
Average total precipitation (inches)	9.41	11.57	9.45	6.69
Average total snowfall (inches)	20.2	45.6	26.4	14.6

Notes:
[a] The Nutters Ranch monitor is located in the Argyle Canyon area near the Wells Draw Alternative.
Source: WRCC 2020b
max. = maximum; °F = degrees Fahrenheit; min. = minimum

Wind speed and direction are important to the dilution and transport of air pollutants. The prevailing winds in the region are generally from the westerly directions. At Indian Canyon Summit, a meteorological monitoring station representative of the western part of the regional study area, winds are usually from the west-northwest or southeast and the average wind speed is 6.2 miles per hour (University of Utah 2020). At Five Mile, a meteorological monitoring station representative of the Argyle Canyon area along the Wells Draw Alternative, winds are usually from the south-southwest to west-southwest or the west-northwest to northwest and the average wind speed is 8.2 miles per hour (Iowa State University 2020). At Pleasant Valley, a meteorological monitoring station representative of the eastern part of the regional study area including the Myton area, winds are usually from the west and the average wind speed is 6.0 miles per hour (Utah State University

2020). Because of the rough topography in much of the region, winds in the area can vary considerably from regional conditions. For example, in a narrow valley or canyon the wind may tend to blow predominantly along the length of the canyon rather than across the valley or canyon.

3.7.2.3 Measured Pollutant Concentrations

Utah DEQ measures ambient air quality at numerous locations around the state including three monitoring stations located in the Basin. These are located in the cities of Price, Roosevelt, and Vernal. Table 3.7-3 summarizes ambient pollutant concentrations measured at these stations for the most recent 3 years of available data.

Table 3.7-3. Measured Ambient Concentrations in the Uinta Basin

Pollutant[a]	Monitor Location (USEPA Site Identifier)	Averaging Period, Unit, Form of Standard	NAAQSs	Measured Concentrations 2017	2018	2019
Nitrogen dioxide	Price (49-007-1003)	1-hour, parts per billion, 98th percentile	100	22	13	17
		Annual, parts per billion, annual mean	53	2.7	1.6	2.1
	Roosevelt (49-013-0002)	1-hour, parts per billion, 98th percentile	100	26.3	20.4	28.8
		Annual, parts per billion, annual mean	53	4.1	3.4	4.6
	Vernal (49-047-1004)	1-hour, parts per billion, 98th percentile	100	32	19	30
		Annual, parts per billion, annual mean	53	4.0	2.6	3.3
Ozone	Price (79-007-1003)	8-hour, parts per million, 4th maximum	0.070	0.066	0.073	0.068
	Roosevelt (49-013-0002)	8-hour, parts per million, 4th maximum	0.070	0.078	0.071	0.087
	Vernal (49-047-1004)	8-hour, parts per million, 4th maximum	0.070	0.068	0.069	0.065
PM2.5	Roosevelt (49-013-0002)	24-hour, micrograms per cubic meter, 98th percentile	35	28.2	24.9	23.0
		Annual, micrograms per cubic meter, annual mean	12	6.2	7.0	6.3
	Vernal (49-047-1004)	24-hour, micrograms per cubic meter, 98th percentile	35	20.6	19.8	16.1
		Annual, micrograms per cubic meter, annual mean	12	5.7	5.8	5.2

Notes:

[a] There are no Utah DEQ monitoring stations in the Uinta Basin that measure carbon monoxide, lead, particulate matter - 10 microns, or sulfur dioxide.

Source: USEPA 2019c
PM2.5 = particulate matter 2.5 microns or less in diameter; USEPA = U.S. Environmental Protection Agency; NAAQS = National Ambient Air Quality Standards

USEPA designates areas where criteria air pollutant levels are less than the National Ambient Air Quality Standards (NAAQS) as "attainment" areas and where pollutant levels exceed the NAAQS as "nonattainment" areas. USEPA designates former nonattainment areas that have attained the NAAQS as "maintenance" areas. USEPA has designated the Basin as an attainment area for all pollutants except ozone because measured concentrations of ozone in the eastern part of the Basin have exceeded the NAAQS in winter (Figure 3.7-2). For example, Table 3.7-3 indicates that ozone concentrations at the Roosevelt monitor exceeded the NAAQS in 2017, 2018, and 2019. These high ozone levels have been observed only in the Basin during winter when the ground is covered by snow and stagnant atmospheric conditions are present; ozone levels at other times have been less than the NAAQS (Utah DEQ 2015a).

The eastern portion of the proposed rail line would be located in the Uinta Basin Ozone Nonattainment Area. A smaller portion of the proposed rail line, at the western edge of the Basin, would be located in Utah County, which is a maintenance area for PM10 (Figure 3.7-2). The remainder of the proposed rail line would be located in attainment areas.

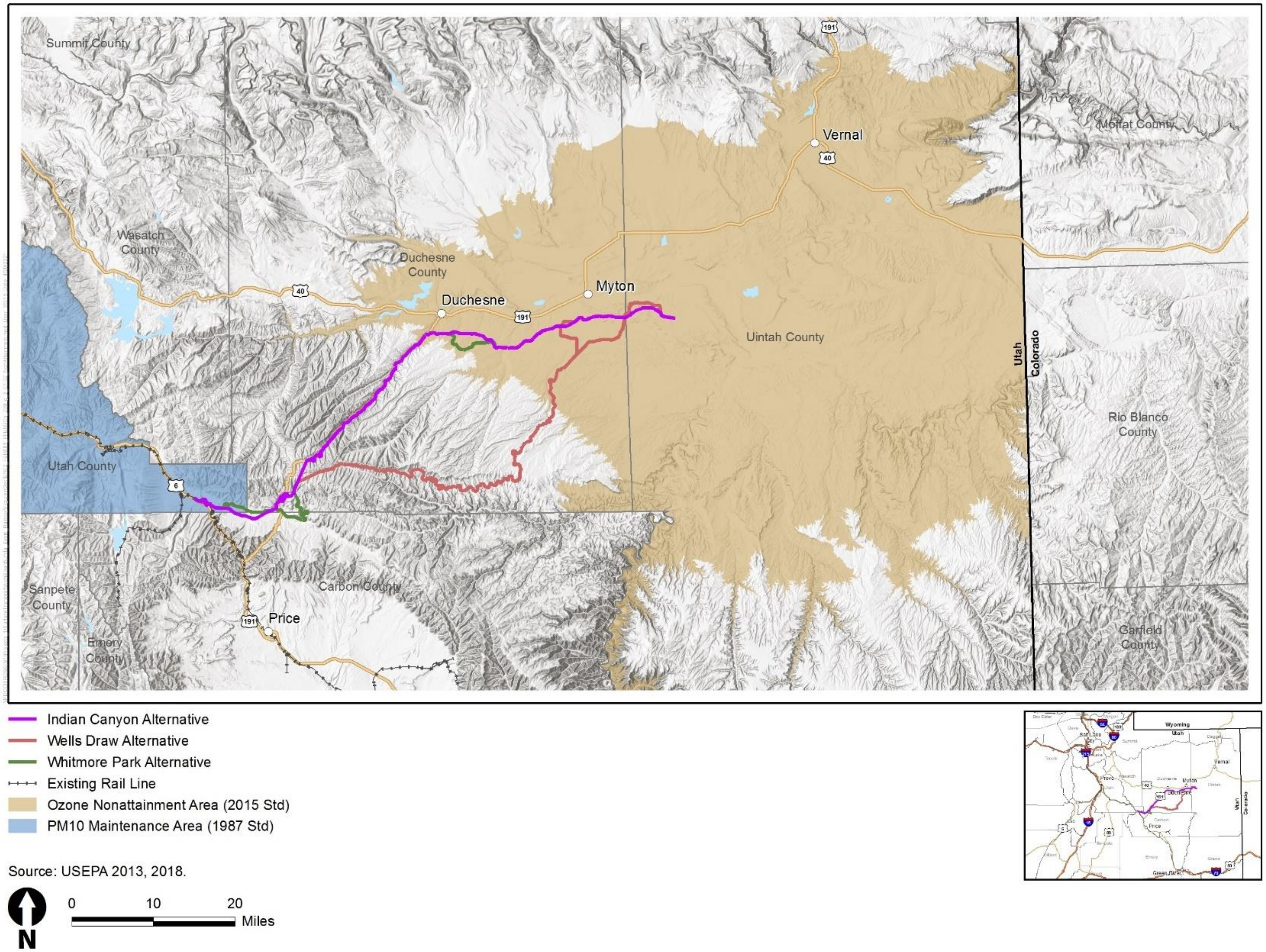
~~3.7.2.1~~3.7.2.4 Air Quality Related Values

The primary AQRVs of concern in the regional study area are visibility and acid deposition. USEPA monitors visibility and acid deposition at national parks, national monuments, and other locations where AQRVs are of concern. USEPA monitors visibility at national parks through its Interagency Monitoring of Protected Visual Environments (IMPROVE) Program. The IMPROVE stations nearest to the regional study area are located at Capitol Reef and Canyonlands National Parks, approximately 44 miles and 37 miles from the regional study area, respectively. Visibility at these parks, measured in 2008 through 2018, was worse than natural conditions but showed improving trends for the clearest and haziest days (BLM 2018).

USEPA also monitors deposition of air pollutants at national parks through its Clean Air Status and Trends Network (CASTNET) program. The CASTNET stations nearest to the regional study area are located at Dinosaur National Monument, which is within the regional study area, and Canyonlands National Park, which is approximately 37 miles from the regional study area.

The National Park Service rates deposition levels as *good condition*, *moderate concern*, or *significant concern*. At Dinosaur National Monument, nitrogen deposition is rated moderate concern, while sulfur deposition is rated good condition (BLM 2018). At Canyonlands National Park, nitrogen deposition is rated significant concern, while sulfur deposition is rated good condition (BLM 2018).

Figure 3.7-2. ~~Ozone~~ Nonattainment and PM10 Maintenance Areas



3.7.2.5 Downline Study Area

The downline study area includes attainment areas as well as the Denver Metro/North Front Range air quality nonattainment area (Appendix C, *Downline Analysis Study Area and Train Characteristics*, Figure C-1), and maintenance areas for CO and PM10. The Colorado Department of Public Health and Environment has prepared plans to address air quality in the nonattainment and maintenance areas. These plans include the *Denver Metro 2008 8-hour Ozone NAAQS Moderate Nonattainment Area Plan* (2016), which will be superseded upon approval of the *Denver Metro 2008 8-hour Ozone NAAQS Serious Nonattainment Area Plan* (draft released in September 2020), the *Denver Metro Carbon Monoxide Maintenance Plan* (2005), and the *Denver Metro PM10 Maintenance Plan* (2005). Meteorological and climatic conditions in the downline study area vary widely because of its large geographic area, varied topography, and multiple airsheds.

3.7.2.6 Climate

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of GHGs such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several industrial gases in Earth's atmosphere. The International Panel on Climate Change (IPCC) estimates that the global average concentrations of CO_2, CH_4, and N_2O in the atmosphere have increased by around 40, 150, and 20 percent, respectively, from pre-industrial times until today (IPCC 2014). An increase in GHG emissions is thought to result in an increase in Earth's average surface temperature, primarily by trapping heat and, thus, decreasing the amount of heat energy radiated by Earth back into space. This phenomenon is commonly referred to as *global warming*. Global warming is expected, in turn, to affect land and sea surface temperatures, precipitation rates, weather patterns, average sea level, polar ice levels, ocean acidification, and other climatic variables, effects which collectively are referred to as *climate change*.

The IPCC Fifth Assessment Report (IPCC 2014) indicates that the climate system is warming. The report states that global mean surface temperature has increased since the late 19th century and that maximum and minimum temperatures over land have increased on a global scale since 1950. In addition, the globally averaged combined land and ocean surface temperature data show a warming of 0.85 degrees Celsius (°C) or 1.5 degrees Fahrenheit (°F) since 1950. The IPCC concludes that it is extremely likely that human influence has been the dominant cause of the observed warming. The IPCC (2014) has predicted that the average global temperature rise between 1986 and 2100 could be as great as 4.8°C (8.6°F), which could have massive deleterious impacts on the natural and human environments.

Observed data indicate that climate change is not uniform across the globe and varies by region. The U.S. Global Change Research Program (GCRP) has reported significant trends in regional climate over the last few decades. Data collected during the last half century in the Mountain West show an approximate 1.5°F increase in average surface temperature (GCRP 2009), with the largest increase in average temperature occurring in the winter months. The research also notes a decrease in the number of relatively cold days, an increase in the number of relatively warm days, and an increase in precipitation. The most recent assessment for the GCRP Southwest Region (GCRP 2018), which includes Utah, predicts that temperatures and precipitation over the region will continue to increase. In addition, the assessment predicts that the frequency of extreme weather events such as heat waves, droughts, and heavy rainfall will also increase and may affect water resources, forests and wilderness areas, agricultural and ranching activities, and human health.

The U.S. Geological Survey (USGS 2021) notes that mountain ecosystems in the western United States are particularly sensitive to climate change, especially in the higher elevations, where much of the snowpack occurs, and which have experienced three times the global average temperature increase over the past century. Higher temperatures are causing more winter precipitation to fall as rain rather than snow, which contributes to earlier snowmelt. Additional declines in snowmelt associated with climate change are projected, which would reduce the amount of water available during summer (GCRP 2009). Rapid spring snowmelt due to sudden and unseasonal temperature increases can also lead to greater erosive events and unstable soil conditions. Increases in average summer temperatures and earlier spring snowmelt are expected to increase the risk of wildfires by increasing summer moisture deficits (GCRP 2009). Studies have shown that earlier snowmelts can lead to a longer dry season, which increases the incidence of catastrophic fire (Westerling et al. 2006). Together with historic changes in land use, climate change is anticipated to increase the occurrence of wildfire throughout the western United States (USGS 2021).

Predictions of climate change in Utah are similar to the more general predictions for the Mountain West and western United States and are summarized below (Salt Lake County Health Department 2017).:

- Overall warming will continue, with longer and hotter heat waves in the summer, a longer freeze-free season, a higher average annual temperature, and fewer cold spells.
- Droughts will become hotter, more severe, and more frequent.
- Late--season snowpack will continue to decrease, as will levels of soil moisture and river flow.
- Precipitation extremes in winter will become more frequent and more intense.
- Seasonal flooding will become more frequent and intense.
- The distribution of plant and animal species in the region will change, as will the timing of species' regional life cycles.
- Occurrence of wildfires will increase.

3.7.3 Environmental Consequences

Construction and operation of the proposed rail line could result in impacts on air quality and GHG emissions. This subsection first presents the potential impacts that would be the same for all three Action Alternatives and then compares the potential impacts that would be different for each Action Alternative. For comparison purposes, this subsection also describes air quality and GHG emissions under the No-Action Alternative.

3.7.3.1 Impacts Common to All Action Alternatives

This subsection describes the potential impacts related to air quality and GHG emissions that would be the same across the three Action Alternatives. The analysis in this subsection quantifies the emissions of air pollutants and discusses the predicted dispersion of criteria air pollutants in the study area. Section 3.15, *Cumulative Impacts*, and Appendix M, *Air Quality Emissions and Modeling Data*, include additional assessments of impacts on AQRVs, including visibility and acid deposition, in a larger geographic context. With the elimination of lead in automotive gasoline, lead is no longer emitted from transportation sources in more than negligible quantities. Therefore, this analysis does not address lead.

Construction

Exhaust Emissions

Construction of any of the Action Alternatives would emit air pollutants and GHGs. Construction equipment, trucks, and workers' personal vehicles would emit diesel and gasoline exhaust, which contain various air pollutants, including CO, NO_X, and particulate matter. Exhaust emissions from construction activities would be temporary and, at any given time, would occur only where construction is occurring or along roads traveled by construction vehicles. The effects of construction emissions on ambient air quality would vary with time due to the construction schedule, the mobility of the emissions sources, the types of equipment in use, and local meteorology. GHG emissions from construction activities would also only take place during the construction period, which would last between 20 and 48 months, depending on the Action Alternative and weather conditions. The majority of CO emissions during construction would be associated with vehicles commuting construction employees, which would account for between 73 and 83 percent of CO emissions. Much of NO_X and particulate emissions during construction would be associated with constructing surface track, which would account for between 46 and 53 percent of NO_X emissions, and between 61 and 63 percent of particulate matter emissions during construction, depending on the Action Alternative. Emissions related to tunnel construction would be temporary and located away from sensitive receptors; tunnel construction emissions from haul trucks would be well dispersed along access roads. Tunnel construction emissions from off-road equipment and blasting would be highly localized to the staging area immediately adjacent to the tunnel entrances, as well as within the tunnels themselves.

To minimize emissions from construction equipment, the Coalition is proposing voluntary mitigation (VM-24) to work with its contractors to make sure that construction equipment is properly maintained and that mufflers and other required pollution-control devices are in working order. In addition, OEA is recommending mitigation that would require the Coalition ensure that all engine-powered equipment and vehicles used in construction are inspected regularly and maintained on schedule (AQ-MM-1) and ensure construction contractors provide transportation for workers from a central location to reduce vehicular traffic in order to minimize air pollutant emissions (AQ-MM-2). OEA is also recommending mitigation requiring the Coalition to post signage and/or fencing during construction, including tunnel construction, to ensure that members of the public would be unable to enter areas within the construction easement that could experience temporary adverse air quality impacts (AQ-MM-7). If these mitigation measures are implemented, OEA does not expect that the exhaust emissions from construction activities would significantly affect air quality. The construction emissions calculations include mitigation measures VM-24 and AQ-MM-1; emissions would be reduced further with mitigation measure AQ-MM-2. Subsection 3.7.3.2, *Impact Comparison between Action Alternatives*, compares air pollutant emissions from construction activities, including exhaust emissions, and concentrations of air pollutants across the three Action Alternatives. Appendix M, *Air Quality Emissions and Modeling Data,* provides further detail on the construction emissions calculations, including exhaust emissions.

Fugitive Dust Emissions

Excavation and earthmoving activities, vehicle and equipment movement over unpaved roads and surfaces, and wind erosion of exposed soil and materials would emit fugitive particulate matter, including small particles (PM10 and PM2.5) that can reduce air quality and are dangerous for human health. These emissions would be temporary and would occur only in areas construction is occurring at any given time. The Coalition has proposed voluntary mitigation to minimize fugitive dust emissions during construction by spraying water and implementing other dust treatments (VM-23). Because fugitive dust emissions from construction activities would be temporary and would move over time, OEA does not expect that those emissions would significantly affect air quality if the Coalition implemented its voluntary mitigation. The construction emissions calculations assume implementation of mitigation measure VM-23. Subsection 3.7.3.2, *Impact Comparison between Action Alternatives*, compares air pollutant emissions from construction activities, including fugitive dust emissions, and concentrations of air pollutants across the three Action Alternatives. Appendix M, *Air Quality Emissions and Modeling Data,* provides further detail on the construction emissions calculations, including fugitive dust emissions.

Operations

Locomotive Exhaust Emissions

During rail operations, locomotives would emit exhaust, which would affect air quality. Locomotives would be the largest source of emissions associated with rail operations~~, but total locomotive emissions would be small relative to existing emissions in Utah and in the regional study area (Table 3.7-1)~~. The amount of locomotive exhaust emitted would vary depending on the volume of train traffic. The Coalition anticipates that average train traffic on the proposed rail line could be as low as 3.68 trains per day (low rail traffic scenario) or as high as 10.52 trains per day (high rail traffic scenario), including trains both entering and leaving the Basin. The number of trains that would actually move on the proposed rail line would depend on future market conditions, including demand for crude oil from the Basin, but would be between these two scenarios. The amount of locomotive exhaust emitted would also vary between the Action Alternatives, as described in Subsection 3.7.3.2, *Impact Comparison between Action Alternatives*. OEA is recommending mitigation (AQ-MM-3) requiring the Coalition develop and implement an anti-idling policy for rail operations. This mitigation measure would ensure that equipment operators receive training on best practices for reducing fuel consumption to reduce project-related emissions. Most impacts related to locomotive emissions, however, would be unavoidable.

During the scoping process, several commenters expressed concerns regarding air pollutant emissions in rail tunnels. Typically, air pollutants in rail tunnels are either expelled at the tunnel entrances and, for longer tunnels, at ventilation shafts. The Coalition would finalize the design of tunnels, including the design of any ventilation-related features, during the final design process following the end of the Board's environmental review. Mechanical ventilation could be provided by jet fans (small-diameter, ductless fans mounted to the tunnel walls or ceiling that move air at high velocity toward the entrances) or other fan types. OEA anticipates that air quality impacts related to locomotive exhaust emissions in tunnels would occur within the tunnels themselves or immediately adjacent to the tunnel entrances. If the Coalition were to install ventilation shafts, then air pollutant concentrations would be elevated in the area immediately adjacent to the ventilation shaft outlet.

Motor Vehicle Exhaust Emissions

Operation of any of the Action Alternatives would contribute vehicle exhaust emissions from vehicles that are idling while delayed at road-rail grade crossings. Idling emissions have decreased significantly since the Clean Air Act was passed. Exceedances of the NAAQS are now very rare even at the most congested, high-rail-traffic intersections. OEA estimated the increase in vehicle delays based on the estimated delays discussed in Section 3.1, *Vehicle Safety and Delay*. Based on the estimated amounts of increased delay, OEA concluded that the increases in exhaust emissions from idling vehicles delayed at grade crossings under any of the Action Alternatives would be small, would be very unlikely to lead to an exceedance of the NAAQS, and as a result would not have a substantial impact on air quality.

Truck Exhaust Emissions

Operation of any of the Action Alternatives would reduce exhaust emissions from trucks carrying crude oil. Currently, crude oil from the well fields in the Basin is trucked to the Price River Terminal in Wellington, Utah, for shipment to refineries, or is trucked to refineries in Salt Lake City. OEA does not expect the proposed rail line to affect truck traffic to refineries in Salt Lake City in the short term. However, OEA expects that trucks that currently access the Price River Terminal would, instead, access the new terminals in Myton and Leland Bench for shipment on the proposed rail line, because the distance to the new terminals would be less than to the Price River Terminal. The resulting reduction in truck vehicle miles traveled would lead to reductions in the trucks' exhaust emissions. OEA quantified these reductions, which would reduce the regional air quality impacts of the proposed rail line. These emissions reductions (i.e., benefits) are presented in Table 3.7-4. The values in Table 3.7-4 reflect the assumptions discussed in Section 3.1, *Vehicle Safety and Delay.*

Depending on market conditions, including the price of crude oil, the production of crude oil in the Basin could increase significantly in the future. If the proposed rail line were constructed, trucks would likely transport much of the additional crude oil to the rail terminals near Myton and Leland Bench. This would increase local truck traffic and truck exhaust emissions. Because increased crude oil production in the Basin is not part of the Coalition's proposed action and because the Board has no jurisdiction over and no way to predict future oil development in the Basin, an assessment of increased exhaust emissions from local truck traffic in the Basin would not be appropriate in this section. OEA has instead assessed emissions related to increased oil production, including truck exhaust emissions, in Section 3.15, *Cumulative Impacts*.

Table 3.7-4. Emissions Benefits from Diverted Crude Oil Truck Trips

Pollutants and GHGs	Change in Emissions[a]
Criteria Pollutants (U.S. tons/year)	
Carbon monoxide	-3.36
Nitrogen oxides	-9.21
PM10	-0.31
PM2.5	-0.29
Sulfur dioxide	-0.04
VOCs	-0.42
Hazardous Air Pollutants (U.S. tons/year)	
Acetaldehyde	-0.020
Acrolein	-0.003
Benzene	-0.004
1,3-Butadiene	-0.001
DPM	-0.002
Ethylbenzene	-0.053
Formaldehyde	-0.289
Napthalene	-0.005
POM	-0.006
Greenhouse Gases (metric tons/year)	
Carbon dioxide	-4,524
Methane	-0.143
Nitrous oxide	-0.006
CO_2e[b] (100-year GWP)~~CO_2e[b]~~	-4,529
CO_2e[b] (20-year GWP)	-4,536

Notes:

[a] Negative emissions represent an emissions reduction or benefit.

[b] CO_2e values were calculated using the 100-year ~~potential~~ global warming potential (GWP) values from the IPCC Fourth Assessment Report (IPCC 2007). ~~GWP values: carbon dioxide = 1; methane = 25; nitrous oxide = 298.~~100-year GWP values are: carbon dioxide = 1; methane = 25; nitrous oxide = 298. 20-year GWP values are: carbon dioxide = 1; methane = 72; nitrous oxide = 289.

PM10 = particulate matter 10 microns or less in diameter; PM2.5 = particulate matter 2.5 microns or less in diameter; VOCs = volatile organic compounds; DPM = diesel particulate matter; POM = polycyclic organic matter; CO_2e = carbon dioxide equivalent

Downline Air Quality

New rail traffic associated with operation of the proposed rail line would result in changes to rail traffic on existing downline routes. See Appendix C, *Downline Analysis Study Area and Train Characteristics*, for more information about the downline routes and existing traffic levels.

The analysis method for downline air quality impacts is the same as the method OEA used to assess direct air quality impacts in the study area (Subsection 3.7.1, *Analysis Methods*). Based on Board regulations (49 C.F.R. § 1105.7), OEA evaluated air quality impacts for downline segments meeting the following conditions.

- The proposed rail line would result in an estimated maximum increase of eight or more trains per day or at least a 100 percent increase in rail traffic (measured in annual gross ton-miles) in areas designated by USEPA as attainment or maintenance areas under the Clean Air Act for all criteria pollutants. OEA determined that rail traffic would exceed this threshold on one segment (Kyune to Denver) for attainment and maintenance areas. Portions of this segment also pass through designated nonattainment areas.
- The proposed rail line would result in an increase of three or more trains per day or a 50 percent increase in rail traffic (measured in annual gross ton-miles) in areas classified as Class I or nonattainment areas under the Clean Air Act. OEA determined that the estimated maximum increase in rail traffic would exceed this threshold on ~~one~~two segments (Denver Northbound ~~and Denver Eastbound~~and Denver East/North) that traverse nonattainment areas, in addition to the segment with an estimated increase in rail traffic of more than eight trains per day that also traverses nonattainment areas (Kyune to Denver). OEA also determined that that the estimated maximum increase in rail traffic would not exceed the threshold of more than three trains per day on two additional segments that traverse nonattainment areas (Denver Eastbound and Denver Southbound).

OEA calculated air quality impacts related to additional trains resulting from the proposed rail line as follows.

- OEA added the emissions from new rail traffic in each downline segment.
- For rail segments with estimated emissions increases that would exceed the Board's air quality analysis thresholds in attainment areas, and for all segments in nonattainment and maintenance areas, OEA compared the emissions increases to the sum of county-level emissions for the counties through which each segment passes. This indicates how much rail traffic on that segment would contribute to regional emissions.

New rail traffic on ~~two~~three downline rail segments (~~Denver Eastbound,~~ Kyune to Denver, Denver East/North, and Denver Northbound) would exceed the OEA regulatory thresholds as noted previously. All or parts of these segments are in areas that USEPA has designated as nonattainment areas or maintenance areas for the NAAQS. Most of the total mileage of the downline segments is part of the Kyune to Denver segment and located in attainment areas (Table 3.7-5).

Locomotive Exhaust Emissions

OEA estimated the impacts of locomotive exhaust emissions for the five downline segments (Table 3.7-5 and Table 3.7-6) based on the estimated increase in project-related rail traffic for the high rail traffic scenario in 2025. Emissions for the low rail traffic scenario would be less. As shown in Table 3.7-5 and Table 3.7-6, for rail segments in attainment areas, only rail segments with a traffic increase that exceeds the Board's air quality analysis thresholds are shown. In nonattainment or maintenance areas all rail segments are shown.

- Emissions increases of hazardous air pollutants from locomotives would be less than 5 tons per year for any segment and pollutant (Table 3.7-6). Diesel particulate matter (DPM) is an exception at about 108 tons per year because for diesel engines DPM is nearly equivalent to PM10.
- Segment emissions of criteria pollutants as a percent of county-level emissions would be higher for segments that are longer, have more rail traffic, and traverse counties with relatively low

emissions. Because segment emissions represent small percentages of county-level emissions, OEA concludes that comparison to county-level emissions is sufficient to describe the potential impact of the proposed rail line in downline areas, and that further analysis is not necessary. Emissions as a percent of county-level emissions would range as follows (Table 3.7-7).

- **CO:** from less than 0.02 percent (Denver Eastbound segment) to 0.5 percent (Kyune to Denver segment).
- **NO_X:** from 0.17 percent (Denver Eastbound segment) to 4.79 percent (Kyune to Denver segment).
- **PM10:** from less than 0.01 percent (Denver Eastbound segment) to 0.17 percent (Kyune to Denver segment).
- **PM2.5:** from less than 0.01 percent (Denver Eastbound segment) to 0.67 percent (Kyune to Denver segment).
- **VOC:** from less than 0.01 percent (Eastbound segment) to 0.06 percent (Kyune to Denver segment).

The emissions contributions would be spread out over the entire length of the rail segments and would be diluted and dispersed by wind and atmospheric turbulence. As a result, increases in concentrations measured at air quality monitoring sites, if any, are expected to be negligible. The increased downline rail traffic associated with the proposed rail line would not lead to a violation of the NAAQS for counties that are in attainment, and would not increase the severity of conditions in counties that are not in attainment.

- Downline impacts on ambient pollutant concentrations would be comparable to the impacts estimated for the study area. Total concentrations at any particular location would vary depending on total train traffic, local background concentrations, and local topographic and meteorological conditions.
- Emissions increases of GHGs from locomotives would be 712,828 metric tons per year (MT/yr) of ~~carbon dioxide (~~CO_2~~)~~, 56 MT/yr of ~~methane (~~CH_4~~)~~, and 18 MT/yr of ~~nitrous oxide (~~N_2O~~)~~, or 719,204 MT/yr of carbon dioxide equivalent (CO_2e). Compared to the total existing CO_2e emissions of 24,459,223 MT/yr from all downline counties, the locomotive emissions increases would represent 2.9 percent of the county total CO_2e emissions.

Motor Vehicle Emissions

Operation of any of the Action Alternatives would contribute vehicle exhaust emissions from vehicles that are delayed at downline road-rail grade crossings. OEA estimated the increase in vehicle delays based on the estimated delays discussed in Section 3.1, *Vehicle Safety and Delay*. OEA concluded that the estimated increase in vehicle exhaust emissions from idling vehicles delayed at downline grade crossings under any of the Action Alternatives would be small and would not have a substantial impact on air quality.

Table 3.7-5. Estimated Downline Emissions of Criteria Pollutants—Increase in Trains per Day

Rail Segment Description[a] (Attainment Status)[b]	Segment-Subsegment Number	Segment Length (miles)	Maximum Increase in Trains per Day	Locomotive Criteria Pollutant Emissions (tons/year)					
				CO	NO_x	PM10	PM2.5	SO_2	VOC
Denver East/North (N)	DE-01	3.2	8.4	11.04	30.69	0.66	0.64	0.04	1.09
Denver Eastbound (N)	EB-01	1.4	1.1	0.65	1.82	0.04	0.04	0.00	0.06
Denver Eastbound (N)	EB-02	0.7	1.1	0.30	0.83	0.02	0.02	0.00	0.03
Denver Eastbound (N)	EB-03	8.6	1.1	3.91	10.86	0.23	0.23	0.01	0.39
Denver Eastbound (N)	EB-04	18.5	1.1	8.46	23.53	0.51	0.49	0.03	0.84
Denver Eastbound (N)	EB-05	1.1	1.1	0.50	1.39	0.03	0.03	0.00	0.05
Denver Eastbound (A/N)	EB-06	28.8	1.1	13.13	36.49	0.79	0.77	0.05	1.30
Kyune to Denver (A/N)	KD-01	11.1	9.5	43.78	121.68	2.63	2.55	0.15	4.33
Kyune to Denver (A)	KD-02	3.3	9.5	12.96	36.03	0.78	0.76	0.05	1.28
Kyune to Denver (A)	KD-03	171.2	9.5	675.34	1877.08	40.59	39.37	2.38	66.78
Kyune to Denver (A)	KD-04	3.1	9.5	12.35	34.32	0.74	0.72	0.04	1.22
Kyune to Denver (A)	KD-05	0.6	9.5	2.42	6.74	0.15	0.14	0.01	0.24
Kyune to Denver (A/N)	KD-06	265.8	9.5	1048.35	2913.84	63.00	61.11	3.70	103.66
Kyune to Denver (N)	KD-07	2.1	9.5	8.48	23.56	0.51	0.49	0.03	0.84
Denver Northbound (N)	NB-01	43.9	7.3	132.95	369.53	7.99	7.75	0.47	13.15
Denver Northbound (N)	NB-02	15.7	7.3	47.73	132.66	2.87	2.78	0.17	4.72
Denver Northbound (N)	NB-03	0.5	7.3	1.49	4.15	0.09	0.09	0.01	0.15
Denver Northbound (N)	NB-04	9.1	7.3	27.56	76.61	1.66	1.61	0.10	2.73
Denver Southbound (N)	SB-01	4.1	1.1	1.89	5.25	0.11	0.11	0.01	0.19
Denver Southbound (N)	SB-02	8.2	1.1	3.75	10.42	0.23	0.22	0.01	0.37
Denver Southbound (N)	SB-03	42.2	1.1	19.28	53.58	1.16	1.12	0.07	1.91

Rail Segment Description[a] (Attainment Status)[b]	Segment-Subsegment Number	Segment Length (miles)	Maximum Increase in Trains per Day	Locomotive Criteria Pollutant Emissions (tons/year)					
				CO	NO_X	PM10	PM2.5	SO_2	VOC
Denver Eastbound (N)DE-013.28.411.0430.690.660.640.041.09Kyune to Denver (A)	KD-01	1.2	9.5	4.85	13.47	0.29	0.28	0.02	0.48
Kyune to Denver (A)	KD-02	175.0	9.5	690.11	1,918.14	41.47	40.23	2.43	68.24
Kyune to Denver (N)	KD-03	29.9	9.5	118.04	328.09	7.09	6.88	0.42	11.67
Kyune to Denver (A)	KD-04	184.5	9.5	727.71	2,022.63	43.73	42.42	2.57	71.95
Kyune to Denver (N)	KD-05	2.1	9.5	8.48	23.56	0.51	0.49	0.03	0.84
Subtotal Kyune to Denver	KD-01–KD-05	457.4	9.5	1,803.68	5,013.24	108.39	105.14	6.36	178.34
Denver Northbound (N)	NB-01	69.2	7.3	209.73	582.95	12.60	12.23	0.74	20.74

Notes:

[a] In attainment areas, only rail segments with a traffic increase that exceeds the Board's air quality analysis thresholds are shown. In nonattainment or maintenance areas all rail segments are shown.

[b] A = attainment area, N = nonattainment or maintenance area.

CO = carbon monoxide; NO_X = nitrogen oxides; PM10 = particulate matter 10 microns or less in size; PM2.5 = particulate matter 2.5 microns or less in size; SO_2 = sulfur dioxide; VOC = volatile organic compounds

Table 3.7-6. Estimated Downline Emissions of Hazardous Air Pollutants—Increase in Trains per Day

Rail Segment Description[a] (Attainment Status)[b]	Segment-Subsegment Number	Segment Length (miles)	Maximum Increase in Trains per Day	Locomotive Hazardous Air Pollutant Emissions (tons/year)[c]								
				Acetaldehyde	Acrolein	Benzene	1, 3-Butadiene	Ethylbenzene	Formaldehyde	DPM	Naphthalene	POM
~~Denver Eastbound (N)~~	~~DE-01~~	~~3.2~~	~~8.4~~	~~0.02~~	~~0.00~~	~~0.02~~	~~0.00~~	~~0.00~~	~~0.03~~	~~0.66~~	~~0.00~~	~~0.00~~
~~Kyune to Denver (A)~~	~~KD-01~~	~~1.2~~	~~9.5~~	~~0.01~~	~~0.00~~	~~0.01~~	~~0.00~~	~~0.00~~	~~0.01~~	~~0.29~~	~~0.00~~	~~0.00~~
~~Kyune to Denver (A)~~	~~KD-02~~	~~175.0~~	~~9.5~~	~~1.16~~	~~0.14~~	~~1.41~~	~~0.06~~	~~0.00~~	~~1.78~~	~~41.47~~	~~0.13~~	~~0.03~~
~~Kyune to Denver (N)~~	~~KD-03~~	~~29.9~~	~~9.5~~	~~0.20~~	~~0.02~~	~~0.24~~	~~0.01~~	~~0.00~~	~~0.30~~	~~7.09~~	~~0.02~~	~~0.01~~
~~Kyune to Denver (A)~~	~~KD-04~~	~~184.5~~	~~9.5~~	~~1.22~~	~~0.15~~	~~1.49~~	~~0.06~~	~~0.00~~	~~1.88~~	~~43.73~~	~~0.14~~	~~0.04~~
~~Kyune to Denver (N)~~	~~KD-05~~	~~2.1~~	~~9.5~~	~~0.01~~	~~0.00~~	~~0.02~~	~~0.00~~	~~0.00~~	~~0.02~~	~~0.51~~	~~0.00~~	~~0.00~~
~~Subtotal Kyune to Denver~~	~~KD-01–KD-05~~	~~457.4~~	~~9.5~~	~~3.03~~	~~0.37~~	~~3.68~~	~~0.15~~	~~0.00~~	~~4.66~~	~~108.39~~	~~0.33~~	~~0.09~~
~~Denver Northbound (N)~~	~~NB-01~~	~~69.2~~	~~7.3~~	~~0.35~~	~~0.04~~	~~0.43~~	~~0.02~~	~~0.00~~	~~0.54~~	~~12.60~~	~~0.04~~	~~0.01~~
Denver East/North (N)	DE-01	3.2	8.4	0.02	0.00	0.02	0.00	0.00	0.03	0.66	0.00	0.00
Denver Eastbound (N)	EB-01	1.4	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
Denver Eastbound (N)	EB-02	0.7	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Denver Eastbound (N)	EB-03	8.6	1.1	0.01	0.00	0.01	0.00	0.00	0.01	0.23	0.00	0.00
Denver Eastbound (N)	EB-04	18.5	1.1	0.01	0.00	0.02	0.00	0.00	0.02	0.51	0.00	0.00
Denver Eastbound (N)	EB-05	1.1	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Denver Eastbound (A/N)	EB-06	28.8	1.1	0.02	0.00	0.03	0.00	0.00	0.03	0.79	0.00	0.00
Kyune to Denver (A/N)	KD-01	11.1	9.5	0.07	0.01	0.09	0.00	0.00	0.11	2.63	0.01	0.00
Kyune to Denver (A)	KD-02	3.3	9.5	0.02	0.00	0.03	0.00	0.00	0.03	0.78	0.00	0.00
Kyune to Denver (A)	KD-03	171.2	9.5	1.13	0.14	1.38	0.06	0.00	1.74	40.59	0.13	0.03

Rail Segment Description[a] (Attainment Status)[b]	Segment-Subsegment Number	Segment Length (miles)	Maximum Increase in Trains per Day	Locomotive Hazardous Air Pollutant Emissions (tons/year)[c]								
				Acetaldehyde	Acrolein	Benzene	1, 3-Butadiene	Ethylbenzene	Formaldehyde	DPM	Naphthalene	POM
Kyune to Denver (A)	KD-04	3.1	9.5	0.02	0.00	0.03	0.00	0.00	0.03	0.74	0.00	0.00
Kyune to Denver (A)	KD-05	0.6	9.5	0.00	0.00	0.00	0.00	0.00	0.01	0.15	0.00	0.00
Kyune to Denver (A/N)	KD-06	265.8	9.5	1.76	0.21	2.14	0.09	0.00	2.71	63.00	0.19	0.05
Kyune to Denver (N)	KD-07	2.1	9.5	0.01	0.00	0.02	0.00	0.00	0.02	0.51	0.00	0.00
Denver Northbound (N)	NB-01	43.9	7.3	0.22	0.03	0.27	0.01	0.00	0.34	7.99	0.02	0.01
Denver Northbound (N)	NB-02	15.7	7.3	0.08	0.01	0.10	0.00	0.00	0.12	2.87	0.01	0.00
Denver Northbound (N)	NB-03	0.5	7.3	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00
Denver Northbound (N)	NB-04	9.1	7.3	0.05	0.01	0.06	0.00	0.00	0.07	1.66	0.01	0.00
Denver Southbound (N)	SB-01	4.1	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
Denver Southbound (N)	SB-02	8.2	1.1	0.01	0.00	0.01	0.00	0.00	0.01	0.23	0.00	0.00
Denver Southbound (N)	SB-03	42.2	1.1	0.03	0.00	0.04	0.00	0.00	0.05	1.16	0.00	0.00

Notes:

[a] In attainment areas, only rail segments with a traffic increase that exceeds the Board's air quality thresholds are shown. In nonattainment or maintenance areas, all rail segments are shown.

[b] A = attainment area, N = nonattainment or maintenance area.

[c] Values less than 0.005 have been rounded to zero.

DPM = diesel particulate matter; POM = polycyclic organic matter

Table 3.7-7. Estimated Annual Average Downline Emissions Compared to County-Level Emissions

Rail Segment Description[a] (Attainment Status)[b]	Segment-Subsegment Number	Segment Length (miles)	Maximum Increase in Trains per Day	Project Locomotives[c] (tons/year)						Total County Emissions Levels[d] (tons/year)						% of County Level[e] (tons/year)					
				CO	NOx	PM10	PM2.5	SO_2	VOC	CO	NOx	PM10	PM2.5	SO_2	VOC	CO	NOx	PM10	PM2.5	SO_2	VOC
~~Denver Eastbound (N)~~	~~DE-01~~	~~3.2~~	~~8.4~~	~~11~~	~~31~~	~~1~~	~~1~~	~~0~~	~~1~~	~~60,756~~	~~18,029~~	~~11,084~~	~~2,833~~	~~3,314~~	~~17,127~~	~~0.02~~	~~0.17~~	~~0.01~~	~~0.00~~	~~0.02~~	~~0.00~~
~~Kyune to Denver (A)~~	~~KD-01~~	~~1.2~~	~~9.5~~	~~5~~	~~13~~	~~0~~	~~0~~	~~0~~	~~0~~	~~57,190~~	~~14,739~~	~~16,059~~	~~3,017~~	~~268~~	~~32,240~~	~~0.01~~	~~0.09~~	~~0.00~~	~~0.00~~	~~0.11~~	~~0.00~~
~~Kyune to Denver (A)~~	~~KD-02~~	~~175.0~~	~~9.5~~	~~690~~	~~1,918~~	~~41~~	~~40~~	~~6~~	~~68~~	~~82,003~~	~~34,336~~	~~16,731~~	~~4,144~~	~~16,895~~	~~142,396~~	~~0.84~~	~~5.59~~	~~0.25~~	~~0.97~~	~~0.01~~	~~0.05~~
~~Kyune to Denver (N)~~	~~KD-03~~	~~29.9~~	~~9.5~~	~~118~~	~~328~~	~~7~~	~~7~~	~~0~~	~~12~~	~~170,151~~	~~37,917~~	~~24,097~~	~~6,111~~	~~6,023~~	~~49,892~~	~~0.07~~	~~0.87~~	~~0.03~~	~~0.11~~	~~0.01~~	~~0.02~~
~~Kyune to Denver (A)~~	~~KD-04~~	~~184.5~~	~~9.5~~	~~728~~	~~2,023~~	~~44~~	~~42~~	~~3~~	~~72~~	~~88,543~~	~~22,940~~	~~13,700~~	~~4,099~~	~~347~~	~~111,155~~	~~0.82~~	~~8.82~~	~~0.32~~	~~1.03~~	~~0.74~~	~~0.06~~
~~Kyune to Denver (N)~~	~~KD-05~~	~~2.1~~	~~9.5~~	~~8~~	~~24~~	~~1~~	~~0~~	~~0~~	~~1~~	~~60,756~~	~~18,029~~	~~11,084~~	~~2,833~~	~~3,314~~	~~17,127~~	~~0.01~~	~~0.13~~	~~0.00~~	~~0.00~~	~~0.02~~	~~0.00~~
~~Subtotal Kyune to Denver~~	~~KD-01–KD-05~~	~~457.4~~	~~9.5~~	~~1,804~~	~~5,013~~	~~108~~	~~105~~	~~6~~	~~178~~	~~360,894~~	~~104,604~~	~~64,807~~	~~15,628~~	~~23,412~~	~~295,874~~	~~0.50~~	~~4.79~~	~~0.17~~	~~0.67~~	~~0.03~~	~~0.06~~
~~Denver Northbound (N)~~	~~NB-01~~	~~69.2~~	~~7.3~~	~~210~~	~~583~~	~~13~~	~~12~~	~~1~~	~~21~~	~~206,737~~	~~64,211~~	~~47,197~~	~~10,929~~	~~4,326~~	~~128,982~~	~~0.10~~	~~0.91~~	~~0.03~~	~~0.11~~	~~0.02~~	~~0.02~~
Denver East/North (N)	DE-01	3.2	8.4	11.04	30.69	0.66	0.64	0.04	1.09	60,756	18,029	11,084	2,833	3,314	17,127	0.02	0.17	0.01	0.02	0.00	0.01
Denver Eastbound (N)	EB-01	1.4	1.1	0.65	1.82	0.04	0.04	0.00	0.06	139,862	33,519	23,693	5,351	3,880	31,482	0.00	0.01	0.00	0.00	0.00	0.00
Denver Eastbound (N)	EB-02	0.7	1.1	0.30	0.83	0.02	0.02	0.00	0.03	79,106	15,490	12,609	2,518	566	14,355	0.00	0.01	0.00	0.00	0.00	0.00
Denver Eastbound (N)	EB-03	8.6	1.1	3.91	10.86	0.23	0.23	0.01	0.39	139,862	33,519	23,693	5,351	3,880	31,482	0.00	0.03	0.00	0.00	0.00	0.00
Denver Eastbound (N)	EB-04	18.5	1.1	8.46	23.53	0.51	0.49	0.03	0.84	135,579	28,868	23,577	5,522	3,485	33,566	0.01	0.08	0.00	0.01	0.00	0.00
Denver Eastbound (N)	EB-05	1.1	1.1	0.50	1.39	0.03	0.03	0.00	0.05	60,756	18,029	11,084	2,833	3,314	17,127	0.00	0.01	0.00	0.00	0.00	0.00
Denver Eastbound (A/N)	EB-06	28.8	1.1	13.13	36.49	0.79	0.77	0.05	1.30	142,694	30,747	27,186	6,159	3,491	42,249	0.01	0.12	0.00	0.01	0.00	0.00
Kyune to Denver (A/N)	KD-01	11.1	9.5	43.78	121.68	2.63	2.55	0.15	4.33	67,474	20,569	19,971	3,788	10,595	51,793	0.06	0.59	0.01	0.07	0.00	0.01
Kyune to Denver (A)	KD-02	3.3	9.5	12.96	36.03	0.78	0.76	0.05	1.28	57,190	14,739	16,059	3,017	268	32,240	0.02	0.24	0.00	0.03	0.02	0.00
Kyune to Denver (A)	KD-03	171.2	9.5	675.34	1,877.08	40.59	39.37	2.38	66.78	122,486	41,960	29,327	6,701	6,875	123,903	0.55	4.47	0.14	0.59	0.03	0.05
Kyune to Denver (A)	KD-04	3.1	9.5	12.35	34.32	0.74	0.72	0.04	1.22	36,994	5,328	5,780	1,744	121	39,808	0.03	0.64	0.01	0.04	0.04	0.00
Kyune to Denver (A)	KD-05	0.6	9.5	2.42	6.74	0.15	0.14	0.01	0.24	36,994	5,328	5,780	1,744	121	39,808	0.01	0.13	0.00	0.01	0.01	0.00
Kyune to Denver (A/N)	KD-06	265.8	9.5	1,048.35	2,913.84	63.00	61.11	3.70	103.66	195,118	50,967	30,287	7,970	4,613	172,518	0.54	5.72	0.21	0.77	0.08	0.06
Kyune to Denver (N)	KD-07	2.1	9.5	8.48	23.56	0.51	0.49	0.03	0.84	60,756	18,029	11,084	2,833	3,314	17,127	0.01	0.13	0.00	0.02	0.00	0.00
Denver Northbound (N)	NB-01	43.9	7.3	132.95	369.53	7.99	7.75	0.47	13.15	127,631	48,721	34,588	8,411	3,761	114,627	0.10	0.76	0.02	0.09	0.01	0.01
Denver Northbound (N)	NB-02	15.7	7.3	47.73	132.66	2.87	2.78	0.17	4.72	66,875	30,692	23,504	5,578	446	97,500	0.07	0.43	0.01	0.05	0.04	0.00

Rail Segment Description[a] (Attainment Status)[b]	Segment-Subsegment Number	Segment Length (miles)	Maximum Increase in Trains per Day	Project Locomotives[c] (tons/year)						Total County Emissions Levels[d] (tons/year)						% of County Level[e] (tons/year)					
				CO	NOx	PM10	PM2.5	SO_2	VOC	CO	NOx	PM10	PM2.5	SO_2	VOC	CO	NOx	PM10	PM2.5	SO_2	VOC
Denver Northbound (N)	NB-03	0.5	7.3	1.49	4.15	0.09	0.09	0.01	0.15	66,875	30,692	23,504	5,578	446	97,500	0.00	0.01	0.00	0.00	0.00	0.00
Denver Northbound (N)	NB-04	9.1	7.3	27.56	76.61	1.66	1.61	0.10	2.73	66,875	30,692	23,504	5,578	446	97,500	0.04	0.25	0.01	0.03	0.02	0.00
Denver Southbound (N)	SB-01	4.1	1.1	1.89	5.25	0.11	0.11	0.01	0.19	139,862	33,519	23,693	5,351	3,880	31,482	0.00	0.02	0.00	0.00	0.00	0.00
Denver Southbound (N)	SB-02	8.2	1.1	3.75	10.42	0.23	0.22	0.01	0.37	153,929	26,329	25,103	5,207	736	30,794	0.00	0.04	0.00	0.00	0.00	0.00
Denver Southbound (N)	SB-03	42.2	1.1	19.28	53.58	1.16	1.12	0.07	1.91	111,737	17,544	18,222	3,919	319	30,321	0.02	0.31	0.01	0.03	0.02	0.01

Notes:

[a] In attainment areas, only rail segments with a traffic increase that exceeds the Board's air quality analysis thresholds are shown. In nonattainment or maintenance areas, all rail segments are shown.

[b] A = attainment area, N = nonattainment or maintenance area.

[c] Values less than 0.5 have been rounded to zero.

[d] Sum of county-level emissions inventories for all counties through which segment passes (USEPA 2020).

[e] Values less than 0.005% have been rounded to zero.

CO = carbon monoxide; NO_X = nitrogen oxides; PM10 = particulate matter 10 microns or less in size; PM2.5 = particulate matter 2.5 microns or less in size; SO2 = sulfur dioxide; VOC = volatile organic compounds

3.7.3.2 Impact Comparison between Action Alternatives

This subsection describes the potential impacts related to air quality and GHG emissions that would be different between the three Action Alternatives.

Construction

Table 3.7-8 shows the total emissions of air pollutants during construction for each Action Alternative, including emissions from construction equipment, trucks, and workers' personal vehicles. As the table shows, construction of the Wells Draw Alternative would result in the most emissions of air pollutants and of GHGs, followed by the Whitmore Park Alternative and the Indian Canyon Alternative.

Table 3.7-8. Emissions during Rail Line Construction

	Action Alternative		
Pollutants and GHGs	**Indian Canyon**	**Wells Draw**	**Whitmore Park**
Criteria Pollutants (U.S. tons)			
Carbon monoxide	917	1,541	992
Nitrogen oxides	512	649	598
PM10	779	1,075	880
PM2.5	228	299	281
Sulfur dioxide	2	2	2
Volatile organic compounds	94	146	103
Hazardous Air Pollutants (U.S. tons)			
Acetaldehyde	3	5	4
Acrolein	1	1	1
Benzene	3	6	4
1,3-Butadiene	<0.5	1	<0.5
DPM	1	2	1
Ethylbenzene	8	10	9
Formaldehyde	15	17	18
Napthalene	<0.5	1	1
POM	3	3	3
Greenhouse Gases (metric tons)			
Carbon dioxide	206,592	286,499	242,910
Methane	14	21	18
Nitrous oxide	6	10	7
CO_2e[a] (100-year GWP)~~**Total (CO_2e[a])**~~	208,697	289,737	245,304
CO_2e[a] (20-year GWP)	209,411	290,788	246,200

Notes:

[a] OEA calculated CO_2e values using the 100-year ~~potential~~ global warming potential (GWP) values from the IPCC Fourth Assessment Report (IPCC 2007). ~~GWP values: carbon dioxide = 1; methane = 25; nitrous oxide = 298.~~ 100-year GWP values are: carbon dioxide = 1; methane = 25; nitrous oxide = 298. 20-year GWP values are: carbon dioxide = 1; methane = 72; nitrous oxide = 289.

PM10 = particulate matter 10 microns or less in diameter; PM2.5 = particulate matter 2.5 microns or less in diameter; DPM = diesel particulate matter; POM = polycyclic organic matter; CO_2e = carbon dioxide equivalent

< = less than

In consultation with USEPA, OEA has determined that construction of the proposed rail line in the Uinta Basin Ozone Nonattainment Area and the Utah County PM10 Maintenance Area is subject to the USEPA General Conformity Rule (Appendix B, *Applicable Regulations*). OEA compared the estimated construction emissions in these areas to the thresholds in the rule for the applicable pollutants, as shown in Table 3.7-9. The table demonstrates that the estimated construction emissions in each area are less than the conformity thresholds. Therefore, the General Conformity Rule does not require further evaluation of conformity.

Table 3.7-9. Emissions during Rail Line Construction in Areas Subject to General Conformity

Applicable Pollutants (tons per year)	Action Alternative			General Conformity Threshold
	Indian Canyon	Wells Draw	Whitmore Park	
Uinta Basin Ozone Nonattainment Area[a]				
Nitrogen oxides	76.4	49.9	97.1	100
Volatile organic compounds	22.5	18.5	27.1	100
Utah County PM10 Maintenance Area[a]				
Nitrogen oxides[b]	9.6	5.5	15.6	100
PM10	16.2	9.5	26.8	100
Sulfur dioxide[b]	0.03	0.02	0.05	100

Notes:

[a] For each Action Alternative and area, the emissions for the year having the largest construction emissions are shown.

[b] The Utah DEQ PM10 maintenance plan identifies NO_X (but not SO_2) as a PM10 precursor in Utah County (Utah DEQ 2015b).

PM10 = particulate matter 10 microns or less in diameter; SO_2 = sulfur dioxide

Operations

Table 3.7-10 shows the estimated emissions during rail operations for each Action Alternative. The estimates include emissions from locomotives, worker commuting, and reductions in truck trips carrying crude oil from production areas in the Basin to the Price River Terminal. Because emissions would depend on the number of trains operating on the proposed rail line, OEA reported emissions for both the low rail traffic scenario and high rail traffic. To quantify locomotive emissions, OEA assumed that rail traffic would reach full volume in the first year of operation, which is a conservative[6] assumption because locomotive emissions decrease over time as emissions standards become more restrictive and older locomotives are replaced by newer locomotives with lower emissions rates. Unlike construction emissions, locomotive emissions during rail operations are not subject to the General Conformity Rule because the Board does not exercise continuing program control over rail operations and would not exercise such control over the operation of the proposed rail line.

[6] A conservative assumption is an assumption that tends to overstate impacts.

Table 3.7-10. Emissions during Rail Operations

	Low Rail Traffic Scenario			High Rail Traffic Scenario		
Pollutants and GHGs	**Indian Canyon Alternative**	**Wells Draw Alternative**	**Whitmore Park Alternative**	**Indian Canyon Alternative**	**Wells Draw Alternative**	**Whitmore Park Alternative**
Criteria Pollutants (U.S. tons/year)[a]						
Carbon monoxide	136	176	147	373	479	405
Nitrogen oxides	343	413	374	969	1,162	1,056
PM10	10	13	11	29	35	32
PM2.5	7	9	8	21	26	23
Sulfur dioxide	0.4	0.5	0.4	1	2	1
VOCs	13	18	14	36	48	40
Hazardous Air Pollutants (U.S. tons/year)[a]						
Acetaldehyde	0.2	0.3	0.2	0.6	0.8	0.7
Acrolein	<0.05	<0.05	<0.05	0.1	0.1	0.1
Benzene	0.3	0.4	0.3	0.8	1.0	0.9
1,3-Butadiene	<0.05	<0.05	<0.05	<0.05	0.1	<0.05
DPM	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.3	0.4	0.3	0.9	1.1	1.0
Formaldehyde	7	9	8	21	25	23
Napthalene	<0.05	<0.05	<0.05	0.1	0.1	0.1
POM	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Greenhouse Gases (metric tons/year)[a]						
Carbon dioxide	40,106	52,837	44,036	119,041	154,026	129,950
Methane	3	4	4	10	12	10
Nitrous oxide	1	2	1	3	4	3
CO_2e[b] (100-year GWP)~~CO_2e[b]~~	40,511	53,359	44,476	120,162	155,466	131,169
CO_2e[b] (20-year GWP)	40,685	53,584	44,666	120,656	156,101	131,708

Notes:

[a] Values greater than or equal to 1 are rounded to the nearest ton. Values less than 1and greater than or equal to 0.05 are rounded to the nearest 0.1 ton.

[b] CO_2e values were calculated using the 100-year ~~potential~~ global warming potential (GWP) values from the IPCC Fourth Assessment Report (IPCC 2007). ~~GWP values: carbon dioxide = 1; methane = 25; nitrous oxide = 298.~~ 100-year GWP values are: carbon dioxide = 1; methane = 25; nitrous oxide = 298; 20-year GWP values are: carbon dioxide = 1; methane = 72; nitrous oxide = 289.

PM10 = particulate matter 10 microns or less in diameter; PM2.5 = particulate matter 2.5 microns or less in diameter; VOCs = volatile organic compounds; DPM = diesel particulate matter; POM = polycyclic organic matter; CO_2e = carbon dioxide equivalent; < = less than

Regardless of the Action Alternative, the high rail traffic scenario would result in higher emissions than the low rail traffic scenario for all pollutants. Across the three Action Alternatives, the Wells Draw Alternative would result in the most emissions, primarily due to its greater length compared to the Indian Canyon Alternative and the Whitmore Park Alternative.

Under any of the Action Alternatives, air pollutant emissions (Table 3.7-10) would generally represent a small percentage of existing emissions in the regional study area (Table 3.7-1), ranging from less than 0.05 percent to 3.5 percent depending on the pollutant. For GHGs, the Wells Draw Alternative could result in up to 156,101~~211,621~~ metric tons of CO_2e per year under the high rail traffic scenario based on 20-year GWP, which represents approximately 5 percent of GHG emissions in the regional study area, 1 percent of statewide GHG emissions, and 0.0004 percent of global GHG emissions (IPCC 2014). Emissions would be lower for the low rail traffic scenario and under the other two Action Alternatives and would, therefore, represent a smaller percentage of existing GHG emissions. OEA is recommending mitigation measures requiring the Coalition consider actions that would reduce GHG emissions during rail construction and operations (AQ-MM-4, AQ-MM-5, AQ-MM-6, AQ-MM-8).

Air Pollutant Concentrations

Emissions during rail operations would affect the concentration of air pollutants in the regional study area. To quantify air quality impacts for each Action Alternative, OEA modeled the potential ambient concentrations of nitrogen dioxide (NO_2) and PM2.5, which are the pollutants of greatest concern for locomotive emissions. OEA compared the results of the modeling to the NAAQS for NO_2 and PM2.5, to assess the severity of air quality impacts because the NAAQS were established as thresholds to protect human health. For diesel-fueled emissions sources, such as railroads and heavy trucks, the 1-hour NO_2 and 24-hour PM2.5 concentrations are the most likely to approach or exceed the NAAQS among all criteria pollutants and averaging periods. OEA assumed that if the modeled concentrations of NO_2 and PM2.5 would be less than the NAAQS, then concentrations of CO, PM10, and SO_2 for operations also would be less than the NAAQS. OEA also assumed that if the modeled concentrations of NO_2 and PM2.5 would be less than the NAAQS, then there would be no other anticipated NAAQS exceedances in the study area due to operation of the proposed rail line. Appendix M, *Air Quality Emissions and Modeling Data*, provides further information on the air quality modeling methodology.

To determine whether localized pollutant concentrations with locomotive operations could approach or exceed the NAAQS, OEA identified the locations (known as receptors) along the three Action Alternatives that would be most likely to experience higher pollutant concentrations due to topography, meteorology, and rail alignment, as well as emissions. The conditions that can lead to high concentrations include the following factors:

- Steep grade
- Switchbacks
- Winds frequently oriented along the direction of the rail alignment
- Valley location where emissions could be trapped under temperature inversions[7]
- Frequent stagnation conditions[8] or low wind speeds

[7] In a temperature inversion, the temperature of the atmosphere increases with altitude in contrast to the ~~normal~~ typical decrease with altitude. During a temperature inversion, air pollution released into the atmosphere's lowest layer is trapped there and its dispersion is inhibited.

[8] Stagnation is an atmospheric phenomenon where an air mass remains in place over a geographic region for an extended period of time. Stagnation typically consists of these conditions: light winds so that horizontal dispersion is at a minimum, a stable lower atmosphere that inhibits vertical dispersion of pollutants, and absence of precipitation to wash any pollution away.

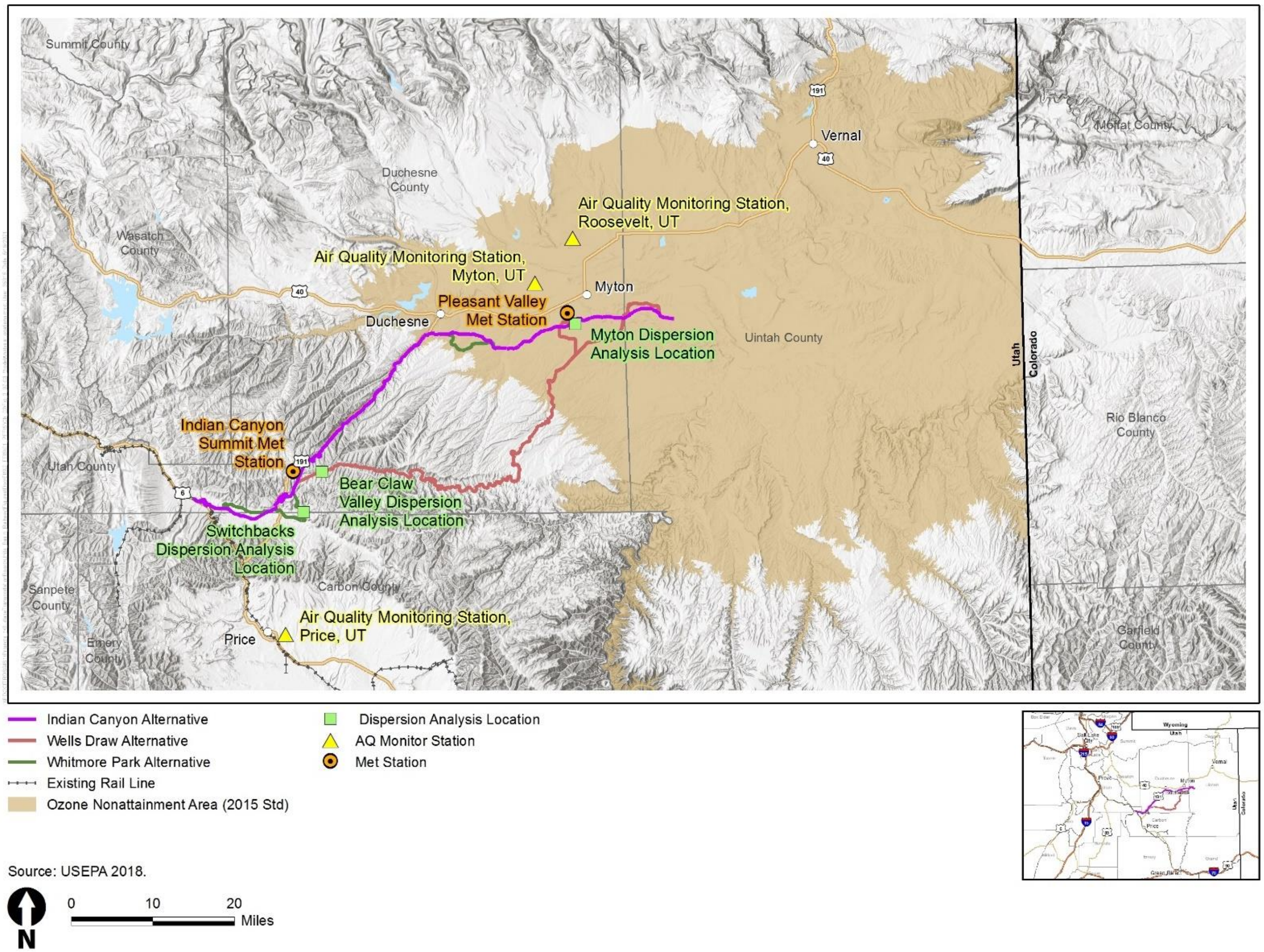
Based on these criteria, OEA identified the following three locations (Figure 3-7.3) as having the greatest likelihood of experiencing concentrations that could exceed the NAAQS.

- **Switchbacks near Minnie Maud Road (Whitmore Park Alternative)**. The rail tracks have four switchbacks climbing from about 7,435 feet to 7,795 feet elevation in 3.10 miles, a 2.2 percent grade. Meteorological data for the area suggest that the wind direction frequently aligns parallel to the rail alignment at this location. Very low wind speeds occur about 5 percent of the time, which could lead to high pollutant concentrations. No residences or other sensitive land uses are near this location.
- **Bear Claw Valley south of Argyle Canyon Road (Wells Draw Alternative).** Meteorological data for the area suggest that the wind direction frequently aligns parallel to the rail alignment at this valley location with relatively slow wind speeds. Very low wind speeds occur about 5 percent of the time, which could lead to high pollutant concentrations. The nearest sensitive land use to this location is a residence about 1,000 feet from the proposed rail alignment.
- **Rail alignment south of Myton (all Action Alternatives).** Meteorological data for the area suggest that the wind direction frequently aligns parallel to the rail alignment at this valley location with relatively slow wind speeds about 10 percent of the time, which could lead to high pollutant concentrations. However, very low wind speeds occur less frequently. There are nearby residences south of Myton. The distance to the nearest residence is about 650 feet for the Wells Draw Alternative, about 1,800 feet for the Whitmore Park Alternative, and about 2,000 feet for the Indian Canyon Alternative.

OEA determined that identifying three study locations based on the expected location of maximum concentrations was the appropriate analysis approach because the proposed rail line represents a single, linear, near-ground source. This analysis approach differs from USEPA's standard modeling guidance, which is oriented toward stationary-source permitting, typically of multiple elevated stationary sources. OEA modeled concentrations of NO_2 and PM2.5 that could occur at these locations just outside of the rail right-of-way,[9] as the maximum concentrations for a rail line source are anticipated to occur within a few hundred meters of the track. OEA only modeled concentrations that could occur under the high rail traffic scenario because that scenario represents the maximum predicted rail traffic that could move on the proposed rail line. To be conservative, OEA assumed for purposes of analysis that the full train volume would occur in the first year of rail operations.

[9] The air quality analysis does not consider concentrations within the right-of-way because entry by humans at any point would constitute trespass except at specific approved locations. These locations would include primarily grade crossings, where human crossing of the right-of-way would not lead to air quality impacts because exposure to pollutant concentrations within the right-of-way would last only seconds to minutes. In addition, portions of the right-of-way could be fenced, which would prevent entry by humans at fenced locations.

Figure 3.7-33**. Modeling Analysis Locations**



Source: USEPA 2018.

OEA used the USEPA AERMOD dispersion model, with the estimated emissions rates,[10] along with meteorological and topographical data for both the local and regional study area, to estimate the concentrations of NO_2 and PM2.5. OEA used background air quality data that are representative of the regional air quality. In modeling the 24-hour PM2.5 and the annual PM2.5 and NO_2 impacts, OEA assumed that the number of trains per day would be constant throughout the year. In modeling 1-hour NO_2 impacts, OEA assumed conservatively that two trains pass by the receptors in the same hour, for every modeled hour. With the predicted train volumes of up to 10.52 trains per day, the time between trains normally would be greater than 1 hour, but two trains passing by in the same hour would be possible. OEA expects that no more than two trains would pass by in the same hour during rail operations. Appendix M, *Air Quality Emissions and Modeling Data*, includes further details on the dispersion modeling. Table 3.7-11 reports the maximum predicted concentrations for the high rail traffic scenario. In all cases, the maximum concentration occurs at the assumed right-of-way boundary (50 feet from the track). Concentrations at larger distances from the track, including at the nearest residences, are lower.

Table 3.7-11 shows that predicted 24-hour PM2.5, annual PM2.5, 1-hour NO_2, and annual NO_2 concentrations would be less than the NAAQS at all three locations that OEA modeled.~~ Predicted 1-hour NO_2 concentrations would be less than the NAAQS at all locations for the Wells Draw Alternative.~~ As discussed previously, nitrogen oxides and particulate matter are the pollutants of greatest concern for locomotive emissions. Locomotive emissions are more likely to cause an exceedance of the 1-hour NO_2 and the 24-hour PM2.5 NAAQS than to cause an exceedance of the NAAQS for other pollutants. Because OEA's model predicts that concentrations of NO_2 and PM2.5 would be less than the 1-hour NO_2 and the 24-hour PM2.5 NAAQS for all three locations, ~~the Wells Draw Alternative,~~ OEA concludes that locomotive emissions would not cause the concentrations of CO, SO_2, and PM10 to exceed the NAAQS for ~~the Wells Draw Alternative~~ any of the Action Alternatives. Because OEA's model was based on the high rail traffic scenario, which represents the maximum predicted volume of train traffic on the proposed rail line, OEA also concluded that lower levels of train traffic, such as what would occur under the low rail traffic scenario, would not result in concentrations of air pollutants that would exceed the NAAQS for any pollutant under any of the Action Alternatives.

[10] OEA based the emissions rates for locomotives on USEPA (2009) guidance and determined that a fleet average emissions rate is the most appropriate approach for this analysis. Use of fleet average emissions is standard practice in mobile source emissions modeling as conducted in state implementation planning (SIPs) as well as in EIS studies. A mix of locomotives that is older than the fleet average would have~~Earlier years provide~~ higher individual emissions rates and would provide more conservative estimates of short-term average concentrations paired with worst-case meteorological conditions. Therefore, modeling an older fleet of locomotives than the fleet average would result in higher estimated concentrations than shown in Table 3.7-11. However, modeling a train that is only pulled by low~~er~~-Tier, higher-emitting locomotives is ~~a worst-case, excessively conservative assumption~~ equivalent to assuming that all trains are pulled by only such locomotives, and that they are operated simultaneously with the occurrence of meteorology that is not conducive to pollutant dispersion, and that this scenario occurs often enough to generate the number of NAAQS exceedances necessary to define a modeled violation of the NAAQS. OEA believes that this is a worst-case, excessively conservative assumption. NEPA does not require analysis of a worst-case scenario.~~ Thus, a fleet average provides a realistic estimate of emissions.~~ Appendix M, *Air Quality Emissions and Modeling Data*, includes further details on modeled emissions rates.

Table 3.7-11. Modeled Maximum Air Pollutant Concentrations in the Project Opening Year under the High Rail Traffic Scenario

Analysis Location, Action Alternative	Receptor Type	PM2.5 (μg/m³) 24-Hour[a] Background[e]	PM2.5 24-Hour Project	PM2.5 24-Hour Total	PM2.5 Annual[b] Background[e]	PM2.5 Annual Project	PM2.5 Annual Total	NO_2 (μg/m³) 1-Hour[c] Background[ef]	NO_2 1-Hour Project	NO_2 1-Hour Total	NO_2 Annual[d] Background[ef]	NO_2 Annual Project	NO_2 Annual Total
Switchbacks near Minnie Maud Road													
Whitmore Park	Maximum Impact	25.2	0.2 ~~0.1~~	25.4 ~~25.3~~	6.3	0.1 ~~<0.1~~	6.4 ~~6.3~~	Variable hourly[g] ~~48.6~~	~~63.7~~	108.0 ~~112.4~~	4.3 ~~3.9~~	3.9 ~~0.6~~	8.2 ~~4.5~~
	Nearest Residence	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bear Claw Valley South of Argyle Canyon Road													
Wells Draw	Maximum Impact	25.2	0.1 ~~<0.1~~	25.3	6.3	<0.1	6.4 ~~6.3~~	Variable hourly[g] ~~48.6~~	~~42.2~~	94.3 ~~90.8~~	4.3 ~~3.9~~	1.6 ~~0.4~~	5.9 ~~4.2~~
	Nearest Residence	25.2	0.1 ~~<0.1~~	25.3	6.3	<0.1	6.4 ~~6.3~~	Variable hourly[g] ~~48.6~~	~~25.1~~	91.0 ~~73.7~~	4.3 ~~3.9~~	0.9 ~~0.3~~	5.2 ~~4.2~~
Rail Alignment South of Myton													
Indian Canyon, Whitmore Park	Maximum Impact	25.2	0.2	25.4 ~~25.3~~	6.3	0.1	6.4	Variable hourly[fg]		111.4 ~~197.4~~	8.3 ~~3.9~~	2.5 ~~2.8~~	10.8 ~~6.7~~
	Nearest Residence	25.2	<0.1	25.3	6.3	<0.1	6.3	Variable hourly[g] ~~48.6~~	~~59.6~~	79.7 ~~108.2~~	8.3 ~~3.9~~	0.7 ~~0.6~~	9.0 ~~4.5~~
Wells Draw	Maximum Impact	25.2	0.1	25.3	6.3	<0.1	6.3	Variable hourly[g] ~~48.6~~	~~124.7~~	103.8 ~~173.3~~	8.3 ~~3.9~~	2.2 ~~1.8~~	10.5 ~~5.7~~
	Nearest Residence	25.2	<0.1	25.~~2~~3	6.3	<0.1	6.3	Variable hourly[g] ~~48.6~~	~~14.1~~	37.2 ~~62.7~~	8.3 ~~3.9~~	0.5 ~~0.2~~	8.8 ~~4.1~~
NAAQS				**35.0**			**12.0**			**188**			**100**

Notes:

[a] Highest of the ~~3~~5-year averages~~ combinations~~ of the 98th percentile of the annual distribution of 24-hour concentrations predicted each year at each receptor for Switchbacks near Minnie Maud Road and Bear Claw Valley South of Argyle Canyon Road, which were modeled with 5 years of meteorological data. For the rail alignment South of Myton, which only had 2 years of meteorological data, the 98th percentile of the daily average was averaged over ~~3~~ 2 years.

[b] Highest of the ~~3~~5-year ~~combinations~~ averages of the annual ~~of the annual average~~ concentrations at each receptor for the 5 years of meteorological data used for Switchbacks near Minnie Maud Road and Bear Claw Valley South of Argyle Canyon Road. For the rail alignment South of Myton, which only had 2 years of meteorological data, the value shown is the highest receptor concentration of the annual average concentration averaged over 2 years.

[c] Highest of the multiyear averages used in the air quality modeling of the 98th percentile of the annual distribution of maximum daily 1-hour concentrations modeled each year at each receptor.

[d] Highest of the annual mean.
[e] Measured at Utah DEQ Roosevelt monitoring site, 290 South 1000 West, Roosevelt, Utah (EPA AIRS code 49-013-0002).
Values that exceed the NAAQS are shown in **bold**. [f] Measured at Myton Uinta Tribal Monitor, Utah (EPA AIRS code 49-013-7011) for rail alignment south of Myton and Price Utah DEQ monitoring site 351 South 2500 East, Price Utah (EPA AIRS code 49-007-1003) for rail alignment for Switchback near Minnie Maud Road and Bear Claw Valley South of Argyle Canyon Road.
[f] [g] Because high modeled concentrations were expected at this location, As explained in Appendix M, *Air Quality Emissions and Modeling Data*, hourly NO_2 background values varied both hourly and seasonally; were used for the rail alignment south of Myton under the Indian Canyon Alternative and Whitmore Park Alternative t. Therefore, there is no single value to report for the background value., as both vary hourly. The range in the seasonal and hour of the day 1-hour NO_2 background concentration is 3.6 7.5 to 49.4 28.4 μg/m³ for Myton and 3.0 to 30.8 μg/m³ for Price. The maximum combination of the paired background and project impact by hour of the day and season is reported as the total.
< = less than; NA = not applicable; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; PM2.5 = particulate matter 2.5 microns or less in diameter; μg/m³ = micrograms per cubic meter

Under the high rail traffic scenario for the Indian Canyon Alternative and Whitmore Park Alternative, OEA's modelling found that the 1-hour NO_2 concentration could exceed the NAAQS at one location south of Myton under certain conditions. If two trains were to pass by this area each hour under unfavorable local weather conditions, then the model suggests that NO_2 concentrations could reach as high as 197.4 μg/m³ near the rail right-of-way, which is higher than the NAAQS of 188 μg/m³ for 1-hour NO_2. OEA believes that this outcome is unlikely to actually occur during rail operations because trains would rarely pass a receptor as frequently as twice in an hour, even under the high rail traffic scenario. In addition, a number of studies have found that the AERMOD model may over-predict maximum 1-hour NO_2 concentration by between 1.7 and 2 times the observed concentration.[11] The maximum modeled 1-hour NO_2 concentrations for the Indian Canyon Alternative and Whitmore Park Alternative might not exceed the NAAQS if the results were adjusted downward for this model bias. The potential exceedance, if it were to occur, would occur within or immediately adjacent to the rail right-of-way. Although there are several residences near the rail line, they are located well outside the right-of-way, and OEA does not expect that those sensitive receptors would experience NO_2 concentrations that would exceed the 1-hour NO_2 NAAQS.

In response to public comments on the Draft EIS, and in consultation with USEPA, OEA reran the dispersion models using different data inputs recommended by USEPA and different modeling parameters recommended by USEPA. Changes to the modeling procedure are documented in Appendix M, *Air Quality Emissions and Modeling Data*. Based on the results of the revised modeling, OEA does not expect that operation of the proposed rail line would result in exceedances of the 1-hour NO_2 NAAQS or the NAAQS for other pollutants.OEA does not expect that operation of the Indian Canyon Alternative or the Whitmore Park Alternative would result in an exceedance of the 1-hour NO_2 NAAQS or the NAAQS for other pollutants at the other modeled locations. Figure 3.7-4 shows the spatial distribution of the maximum predicted 1-hour NO_2 concentrations (without background concentrations) for the Indian Canyon Alternative and Whitmore Park Alternative in the area south of Myton where maximum impacts are predicted. The highest modeled concentrations are shown within the small areas close to and just south of the rail alignment labeled as having maximum 1-hour NO_2 concentrations of 100 ug/m³This is the only area in which a potential exceedance of the NAAQS was modeled. In Figure 3.7-4, the potential NAAQS exceedance could occur locations predicted to experience project-related NO_2 concentrations of 140 μg/m³ or higher. The small areas labeled as having NO_2 concentrations of 140 μg/m³ or higher are the only locations of predicted exceedances.

Figure 3.7-5 through Figure 3.7-7 show the maximum predicted 1-hour NO_2 concentrations (without background concentrations) for the Wells Draw Alternative south of Myton, the Whitmore Park Alternative at the switchbacks near Minnie Maud Road, and the Wells Draw Alternative at Bear Claw Valley south of Argyle Canyon Road, respectively. No exceedances of the NAAQS were predicted at any of those modeling locations. As the figures show, residences near the proposed rail line could experience air pollutant concentrations that would be elevated above background concentrations, but OEA does not expect that any residences or other sensitive receptors would experience air pollutant concentrations that would exceed the NAAQS.

[11] USEPA is aware of this problem and has been actively working on approaches and methods to improve the modeling of the 1-hour NO_2 concentration (American Petroleum Institute 2012; Brode 2014; Owen 2014; RTP Environmental Associates 2013; Podrez 2015).

Figure 3.7-44. **Maximum 1-Hour NO_2 Concentrations (with background) South of Myton (Indian Canyon Alternative and Whitmore Park Alternative)**

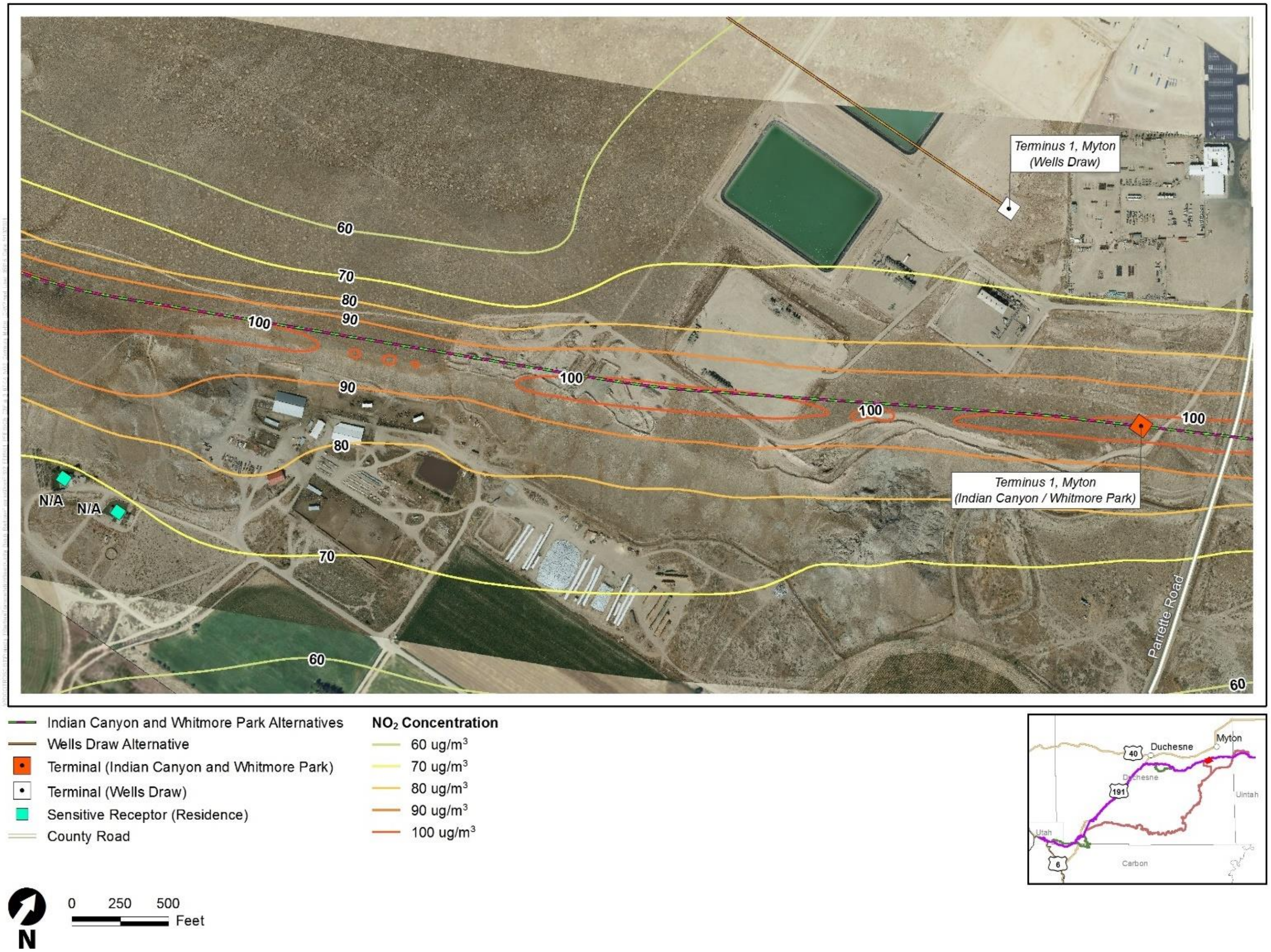


Figure 3.7-5. Maximum 1-Hour NO_2 Concentrations (with background) South of Myton (Wells Draw Alternative)

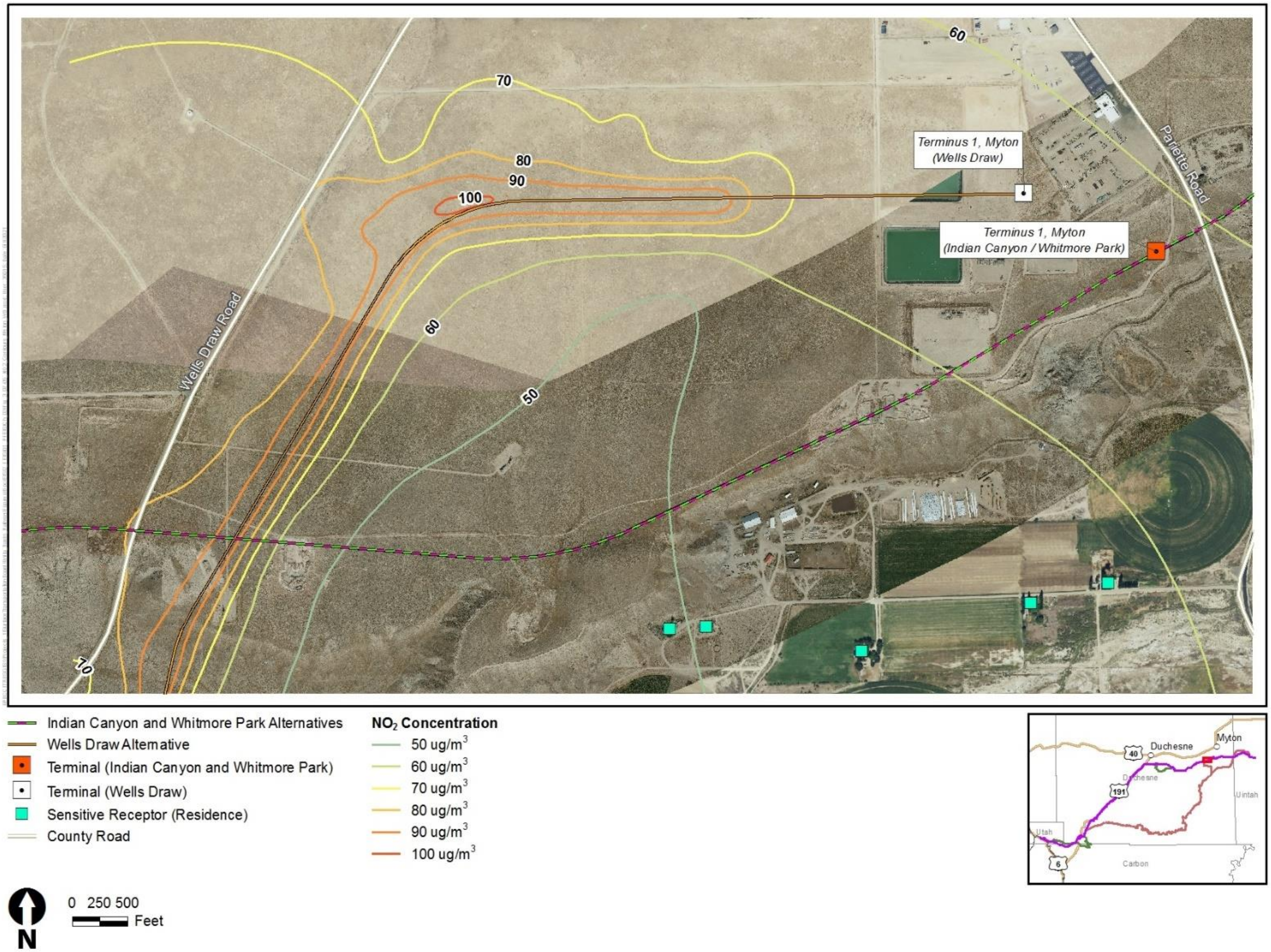


Figure 3.7-6. Maximum 1-Hour NO_2 Concentrations (with background) at Switchbacks South of Minnie Maude Road

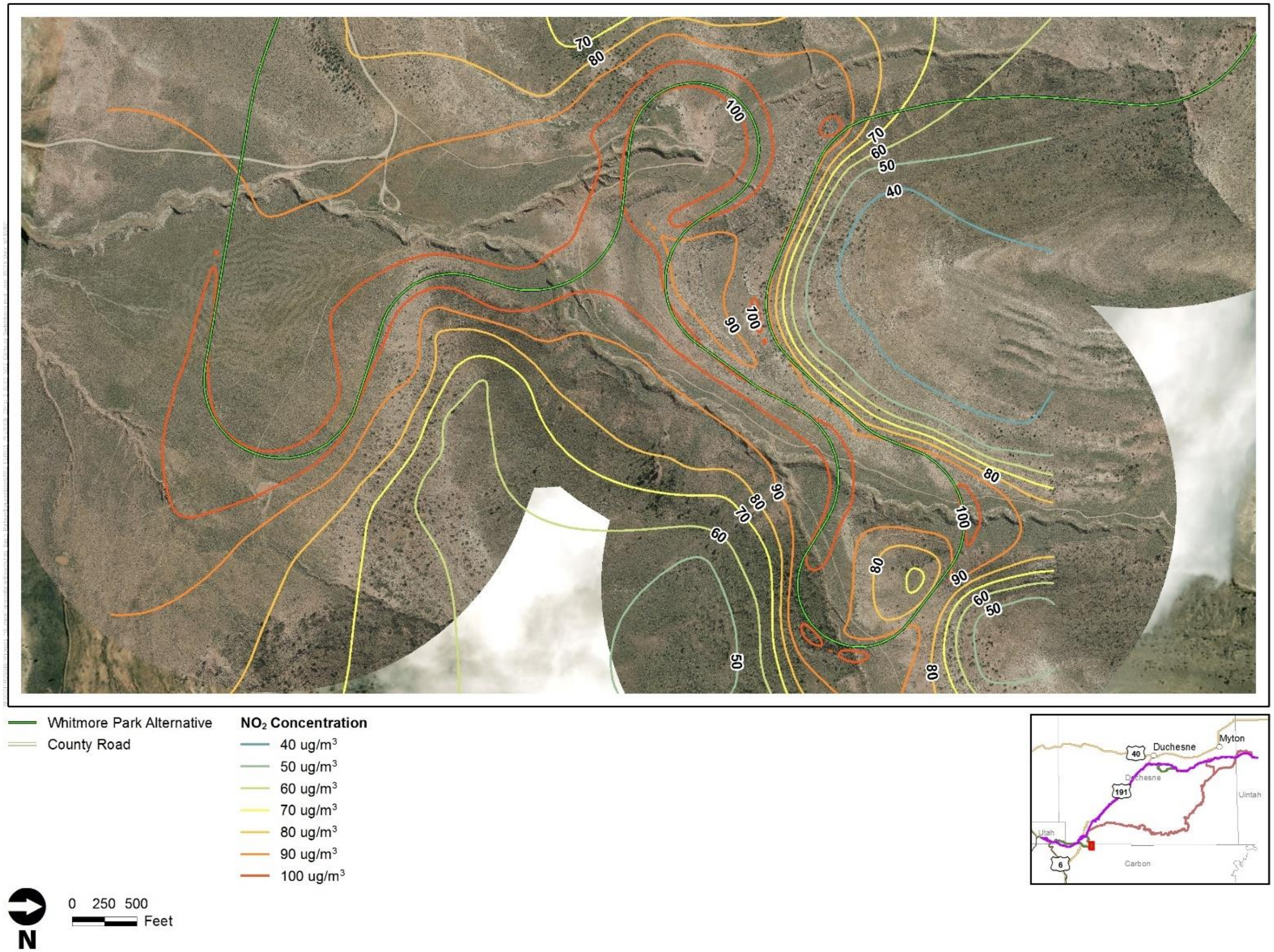
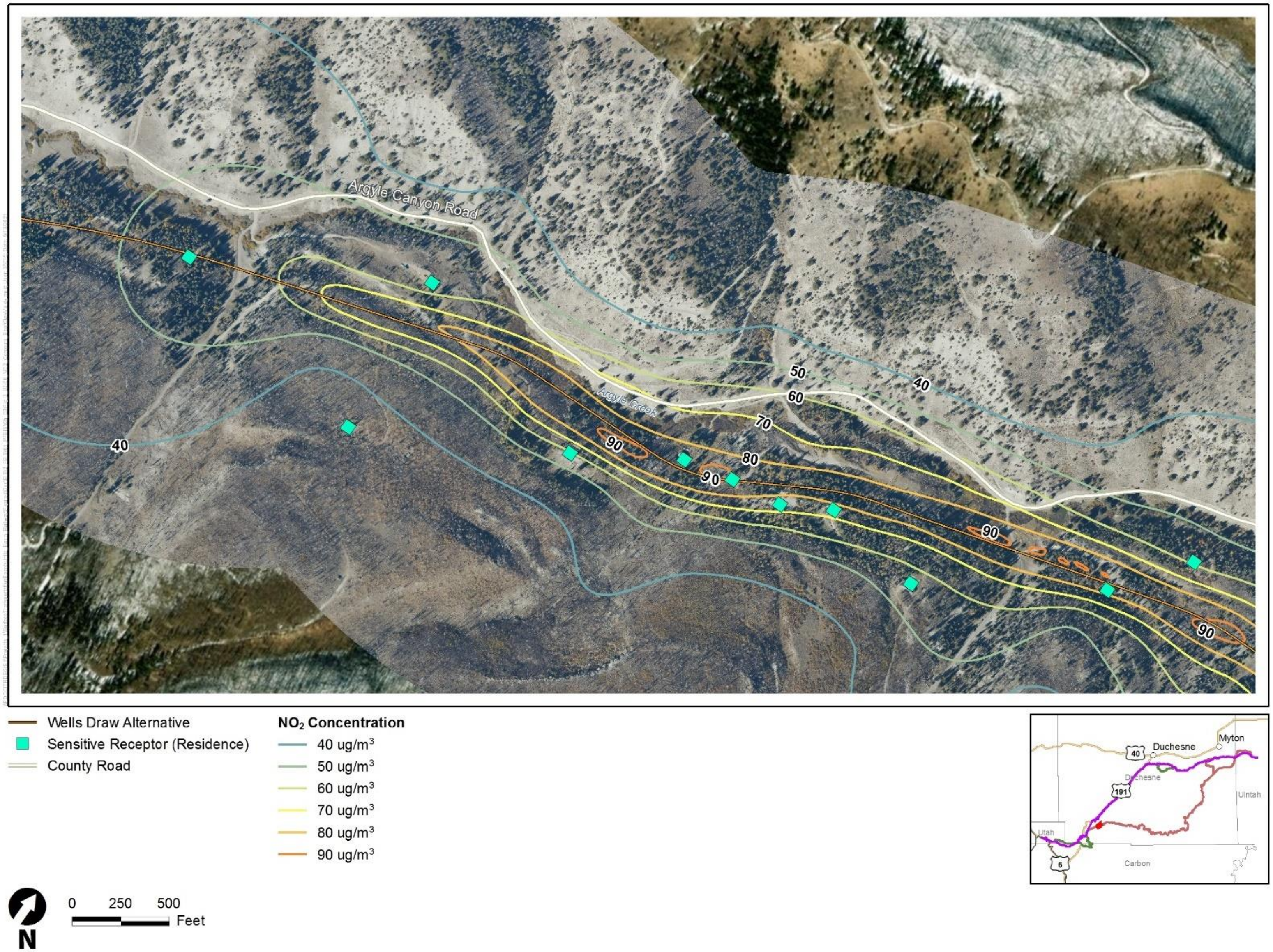


Figure 3.7-7. Maximum 1-Hour NO_2 Concentrations (with background) at Bear Claw Valley South of Argyle Canyon Road



As discussed previously, commenters during the scoping process expressed concerns regarding air quality impacts related to rail operations in tunnels. OEA expects that air quality impacts would be most likely to occur in areas immediately adjacent to tunnel entrances. For the Indian Canyon Alternative and Whitmore Park Alternative, there are no receptors immediately adjacent to the tunnel entrances. For those two Action Alternatives, the closest receptors to tunnel entrances would be more than 1,000 feet of the tunnel entrances, well outside the area that OEA expects could experience adverse air quality impacts. Due to the distance of receptors from tunnel entrances, OEA concludes that the NAAQS would not be exceeded due to locomotive exhaust from tunnels under the Indian Canyon Alternative or Whitmore Park Alternative. For the Wells Draw Alternative, there are three residences within 1,000 feet of the northeastern entrance of the approximate 3.53-mile summit tunnel in Bear Claw Valley, just south of Argyle Canyon Road. These receptors are located 442 feet, 689 feet, and 822 feet from the tunnel entrance. At these distances from the entrances and the track OEA expects that all pollutant concentrations would be less than the NAAQS under the high rail traffic scenario.

3.7.3.3 No-Action Alternative

Under the No-Action Alternative, the Coalition would not construct and operate the proposed rail line, and no construction-related air pollutant emissions would occur. Trucks would continue to transport crude oil from the Basin to the Price River Terminal in Wellington and potentially to other intermodal facilities outside of the Basin. This truck traffic could increase depending on future market conditions, including the price of crude oil, which would result in increased truck exhaust emissions. However, there would be no new locomotive exhaust emissions in the study areas under the No-Action Alternative.

3.7.4 Mitigation and Unavoidable Environmental Effects

Construction of the proposed rail line would involve activities that would emit air pollutants and GHGs. Across the three Action Alternatives, the Wells Draw Alternative would result in the most construction-related air pollutant and GHG emissions, followed by the Whitmore Park Alternative and the Indian Canyon Alternative. Emissions from construction activities would be temporary and would move continually during the construction period. With implementation of the Coalition's voluntary mitigation measure and OEA's recommended mitigation measures, (Chapter 4, *Mitigation*), OEA concludes that impacts related to air quality and GHG emissions would not be significant if those mitigation measures were implemented.

During rail operations, the primary source of air emissions would be locomotives operating on the proposed rail line. Because it is the longest Action Alternative, the Wells Draw Alternative would result in the most total emissions of all pollutants, followed by the Whitmore Park Alternative and then Indian Canyon Alternative. Based on the revised air quality modeling, OEA concludes that operation of the proposed rail line would not cause air pollutant concentrations to exceed the NAAQS at any location. ~~OEA's dispersion model suggests that the Wells Draw Alternative would not cause air pollutant concentrations to exceed the NAAQS under any rail traffic scenario or meteorological conditions. If the Indian Canyon Alternative or the Whitmore Park Alternative were constructed, the maximum 1-hour NO_2 concentration could exceed the NAAQS under the high rail traffic scenario at a location south of Myton in the Basin. This exceedance would be unlikely because it would only occur under unusual operational and meteorological conditions and only if rail traffic on the proposed rail line were at the maximum projected level.Residences in the vicinity of the~~

~~proposed rail line would not experience air quality that would exceed the NAAQS even under those unlikely conditions~~Therefore, OEA concludes that operation of the proposed rail line would not result in significant air quality impacts. ~~The moderate air quality impacts that could result from locomotive emissions during rail operations would be unavoidable.~~ Because the Board does not regulate the volume or composition of train traffic on the interstate rail network or types of locomotives that can operate on rail lines, there is no mitigation that OEA can recommend or that the Board can impose to address air quality impacts related to locomotive emissions.

OEA is recommending mitigation measures (Chapter 4, *Mitigation*) related to GHG emissions, but operation of the proposed rail line would result in unavoidable GHG emissions even if these measures were implemented. GHG emissions from rail operations (Table 3.7-10) would represent a small percentage (ranging from 0.9 percent to 3.5 percent) of existing regional and statewide GHG emissions (Table 3.7-1), however, and would not contribute significantly to global climate change.