Overview

Motorized mine equipment and vehicles, potential large-scale ground surface disturbance and conveyance, and placement of mine tailings can adversely affect air quality through emissions and wind-borne particulates generated during mining operations. Short- and long-term local air quality monitoring records, as well as regional monitoring of National Ambient Air Quality Standards (NAAQS), ozone (O_3), hazardous air pollutants (HAPs), anticipated effects on visibility, and other Federal and State emissions standards are key factors that help to analyze potential project impacts. Class I and Class II sensitive areas are of specific concern.

3.6 Air Quality

3.6.1 Introduction

Air quality conditions are a valuable resource from an aesthetic and human health perspective, and they are subject to specific regulations that aim to protect that resource. Local and regional aspects of air quality may be affected by the proposed action and alternatives during construction, operations, and closure and reclamation. The applicable regulations and policies establish thresholds for evaluating air quality impacts, and this section includes a description of the existing environment and potential consequences (impacts on air quality) of the proposed action and alternatives under that regulatory framework. The regulatory framework protects aesthetic and human health conditions. Beyond regulation of specific contaminants, the Forest Service has further responsibility to consider the impacts of air quality to special areas like wilderness and national parks, and these effects are also considered in this section. We briefly summarize some aspects of the analysis in this section. Additional details not included are captured in the project record (Newell et al. 2018).

3.6.2 Analysis Methodology, Assumptions, and Uncertain and Unknown Information

3.6.2.1 Analysis Area

The full analysis area consists of the area modeled for potential air quality impacts (the “near field” and “far field” areas) and can be seen in figure 3.6.2-1. The physical nature of the emission, along with the location, operating times, and amount of emissions are developed for each emission source. The ambient air quality impacts are assessed at locations (receptors) that begin at the fence line or ambient air boundary of each of the plant sites (East Plant Site, West Plant Site, tailings storage facility, filter plant and loadout facility). The applicable regulations and policies have established thresholds for evaluating air quality impacts and include special provisions for sensitive areas (Class I areas such as national parks and wilderness areas, and certain sensitive Class II areas); these sensitive areas fall within the analysis area as well.

3.6.2.2 Methodology

Air Quality Modeling and Direct Emission Amounts

The assessment of air quality impacts is a complex process that begins with identifying and characterizing the air emission sources and quantifying emission rates from the proposed action, based on the GPO. Air Sciences Inc. (Air Sciences) identified the physical nature of the emissions, along with the location, operating times, and amount of emissions for each emission source. Modeling of

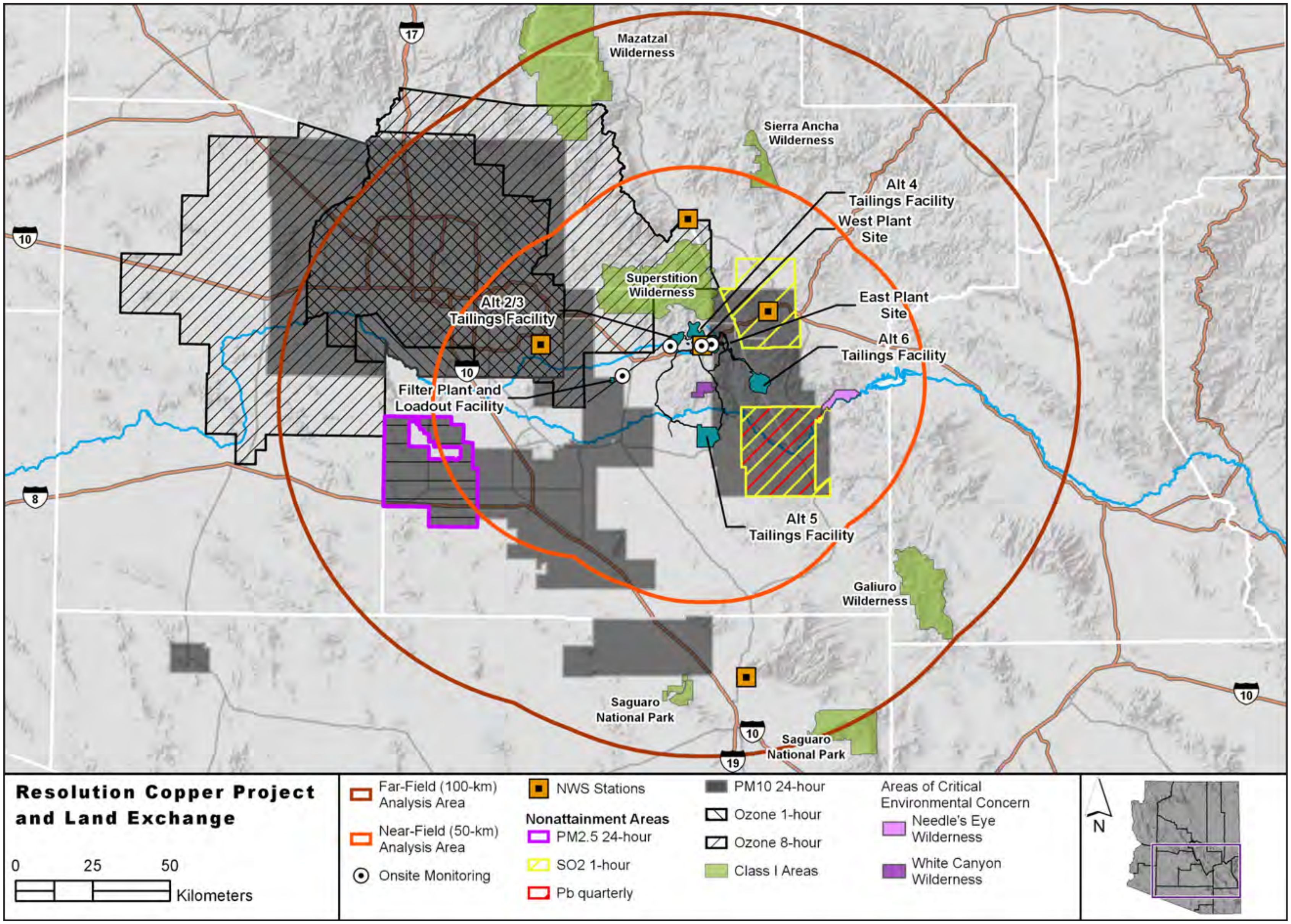


Figure 3.6.2-1. Analysis area showing proposed action and alternatives, sensitive areas, and meteorological monitoring sites

these emissions, combined with background concentrations, is evaluated at the ambient air boundary[26] of each plant site (East Plant Site, West Plant Site, tailings storage facility, filter plant and loadout facility). Those boundaries are shown in figure 3.6.2-1.

Based on guidance from the ADEQ, the EPA, 40 CFR Part 51 Appendix W, and the Forest Service, analysts examined the impacts within 50 km (“near field”) of the site locations with one model, and impacts beyond 50 km (“far field”) with a different dispersion model (Arizona Department of Environmental Quality 2015; U.S. Forest Service et al. 2010). The EPA approves the AERMOD modeling system to determine impacts in the near field of the source or facility. A separate model platform, CALPUFF, is used to determine far field impacts from 50 km to 100 km from the facility or operation. Each model requires a separate set of meteorological data to capture the atmospheric dispersion characteristics, and each model produces a gridded output of impacts at ground-level receptors. The dispersion models relies on 2 continuous years of meteorological data collected from the on-site monitors. The AERMOD dispersion models used 2 continuous years of meteorological data collected from the on-site monitors, and the CALPUFF model used 3 years of gridded data (2015–2017).

Emissions vary over the life of the mine, with the maximum potential emissions occurring in year 14 (Air Sciences Inc. 2019). At this point in time, process sources would be operating at maximum capacity. Fundamentally, the dispersion modeling platforms require that emission sources be categorized into one of two groups based on the physical characteristics of the emission source. *Point* sources are used to model emissions that are released through a vent, stack, or opening. *Area* sources are used to model fugitive emissions sources such as wind erosion from disturbed surfaces, reentrained dust from roadways, and tailpipe emissions from motor vehicles. Each group involves a different approach to characterizing emissions and estimating impacts at nearby receptors (Air Sciences Inc. 2018b). The total emissions for year 14 are provided in table 3.6.2-1 and include emissions for Alternative 2 (Air Sciences Inc. 2018c).

Table 3.6.2-1. Total annual controlled emissions for proposed action (tons/year)

Source Category	CO	NO_X	$PM_{2.5}$	PM_{10}	SO_2	VOC
Process	20.6	44.4	29.2	49.5	15.0	69.3
Fugitive	28.8	5.5	45.4	276.4	1.8	0.2
Mobile	566.0	68.5	3.2	2.9	1.0	33.2
Total	**615.9**	**118.4**	**77.8**	**328.9**	**17.8**	**102.7**

Notes: Totals may not sum exactly due to rounding.

CO = carbon monoxide; NOx = nitrogen oxides; PM2.5 = particulate matter 2.5 microns in diameter or smaller; PM_{10} = particulate matter 10 microns in diameter or smaller; SO2 = sulfur dioxide; VOC = volatile organic compound

For an overall comparison of the alternatives, the potential emissions that pose the greatest concern, and represent the greatest potential differences from an air quality perspective, include fugitive dust (particulate matter 10 microns in diameter or smaller [PM_{10}] and particulate matter 2.5 microns in diameter or smaller [$PM_{2.5}$]) emissions, process PM_{10} and $PM_{2.5}$ emissions, and emissions of nitrogen oxides (NO_X) from diesel-fired equipment. Total lead emissions would be 0.023 ton/year (46 lb/year), and impacts are not further analyzed (Newell et al. 2018).

In addition to these criteria pollutant[27] emissions, there are small amounts of hazardous air pollutants (HAPs) emitted from the proposed project (Newell et al. 2018). The estimated potential HAP emissions

26. The “ambient air boundary” represents the location where air quality is modeled, including both background air quality and contributions from the project. National Ambient Air Quality Standards (NAAQS) must be met at this boundary. For this project, the fence line at each facility along with an established area of restricted access was used to represent the ambient air boundary. Public access is excluded within this area. Therefore, ensuring that regulatory standards are met at this point is protective of public health.

27. “Criteria pollutants” are regulated by the Clean Air Act, and each criteria pollutant has a numeric NAAQS that must be met. There are six basic criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (further divided into PM_{10} and $PM_{2.5}$), and sulfur dioxide (SO_2).

from the project are less than the major source thresholds (10 tons/year of any one HAP or 25 tons/year of all HAPs) under the National Emission Standards for Hazardous Air Pollutants (40 CFR 63). Therefore, the project would be classified as an area source and would be subject only to limited Maximum Achievable Control Technology standards for area sources, as listed in that regulation.

To meet regulatory requirements of the Pinal County Air Quality Control District (PCAQCD), Resolution Copper performed dispersion modeling and impact analyses in support of their permit application to construct this facility. The proposed action qualifies as a “minor source” for PCAQCD permitting purposes. This assessment uses the dispersion modeling analysis to demonstrate compliance with applicable PCAQCD and NAAQS within 50 km of the project area. Details of the AERMOD permitting analysis, input, receptor grids, settings, and results are provided in Air Sciences (2018c). The Forest Service is using the same model to understand and disclose impacts in the EIS.[28] In addition to the ambient air boundary and surrounding nested receptor grid, impacts are also specifically assessed at identified Sensitive Areas and Class I areas (the Superstition Wilderness Area),[29] which are depicted in figure 3.6.2-1.

Within the 50-km distance from the proposed action sites, the analysis also addresses impacts on air quality, acid deposition, and plume blight. Sensitive areas within this range include the Superstition Wilderness, the White Canyon Area of Critical Environmental Concern (ACEC), and the Needle’s Eye Wilderness.

Impacts on regional haze and acidic deposition at Class I areas beyond 50 km and within 100 km of the project are evaluated using the CALPUFF dispersion model system, approved for use by the EPA. Details of the CALPUFF modeling are provided in Air Sciences (2018c). The Class I areas that Air Sciences evaluated include Galiuro Wilderness, Mazatzal Wilderness, Saguaro National Park and Saguaro Wilderness Area, and the Sierra Ancha Wilderness. The analysis of these areas includes air quality impacts, compared with ambient standards and prevention of significant deterioration (PSD) increments, visibility or haze, and deposition of total sulfur and nitrogen.

Generally, air quality impacts from a source decrease with distance from that source. As a first step, areas are screened from analysis using the standard source/distance (U.S. Forest Service et al. 2010) method based on the total emissions of PM_{10}, sulfur dioxide (SO_2), NO_X, and sulfuric acid (H_2SO_4) in tons per year divided by the distance to the area in kilometers. Using this method, Air Sciences screened several areas as too distant: the Pine Mountain Wilderness, Mount Baldy Wilderness, and Sycamore Canyon Wilderness (Air Sciences Inc. 2018c).

Impacts on visibility and deposition are compared with the established acceptable levels of impact at receptors in each Class I area, using both the 24-hour maximum and the annual emission rates to assess visibility and deposition, respectively. Maximum impacts for each Class I and sensitive Class II area are tabulated for each parameter.

Climate Change and Greenhouse Gas Emissions

While global surface air temperatures have increased over the past century, changes in the Southwest have caused markedly increased average annual temperatures and reduced water storage due to early spring snowpack runoff (Garfin et al. 2013; Intergovernmental Panel on Climate Change 2013). It is extremely likely that anthropogenic factors have caused most of the increase in global surface temperatures and emissions of greenhouse gases (Romero-Lankao et al. 2014), which

28. Note that while the same air quality model may be used, the specific output may differ between PCAQCD permitting requirements and Forest Service NEPA requirements. The results shown in the DEIS reflect the total emissions from the project, regardless of whether they are applicable to the PCAQCD permit process.

29. “Class I” areas are defined by the Clean Air Act and receive special consideration for air quality impacts. A Class I area must be specifically designated by the EPA; these usually include national parks, wilderness areas, monuments, and other areas of special national and cultural significance. Most of the rest of the country is considered a “Class II” area. However, in some cases, sensitive Class II areas (such as the White Canyon ACEC) are treated similarly to Class I areas.

include carbon dioxide (CO_2), nitrous oxide, and methane, among others. The trends in temperature and effects of snowmelt runoff, with declining river flow, are predicted to continue into the foreseeable future (Garfin et al. 2013).

The proposed action would lead to emissions of greenhouse gases based largely on fuel use by mobile sources with a minor contribution from process combustion sources. The total greenhouse gas emissions would amount to 173,328 CO_2 equivalent tonnes/year, based on year 14 with the highest emission rates. Project emissions would contribute to ongoing climatic trends.

Indirect Emission Amounts

Modeling for compliance with air quality standards is based on direct emissions from point and area sources for the various components of the project. Additional emissions can be indirectly caused by the project by the expected increase in road traffic for employee travel or deliveries and are estimated in table 3.6.2-2 (Newell et al. 2018).

Table 3.6.2-2. Total annual indirect emissions for proposed action caused by employee traffic and deliveries (tons/year)

Source Category	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
Employees	64.4	3.0	5.5	22.6	0.2	0.7
Deliveries	1.3	3.7	4.7	19.4	0	0.3
Total	**65.7**	**6.6**	**10.1**	**42.0**	**0.2**	**1.0**

Notes: Totals may not sum exactly due to rounding.

CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter 2.5 microns in diameter or smaller; PM_{10} = particulate matter 10 microns in diameter or smaller; SO_2 = sulfur dioxide; VOC = volatile organic compound

Health Risk Assessment

For the purposes of the NEPA analysis, the ability to meet air quality standards is considered protective of public health;[30] therefore, a separate health-based analysis of individual constituents, particularly those associated with particulate emissions, is not necessary in order to disclose impacts on human health (SWCA Environmental Consultants 2018b). However, the levels of metals deposition associated with particulate emissions were estimated and compared with Regional Screening Levels for which the EPA has derived carcinogenic and/or non-carcinogenic chronic health effects. Where the cancer risk health quotient is less than 1, excess cancer risk is less than 1×10^{-6}, and where the non-carcinogenic chronic health effects health quotient is less than 1, the health index for non-carcinogenic chronic health effects is less than 1. For all alternatives, the estimated human health risk associated with the maximum air concentrations of inorganic metals is less than 1×10^{-6} cancer risk (representing a risk below 1.0 for cancer) and below 1.0 for non-carcinogenic chronic health effects. Further background about these estimations can be found in Newell et al. (2018).

Presence of Asbestiform Minerals or Naturally Occurring Radioactive Materials

An analysis was conducted to identify the presence of asbestiform minerals that could become part of the tailings, as well as naturally occurring radioactive materials. A summary of these investigations is contained in Section 3.7.2. Groundwater and Surface Water Quality. The

30. The NAAQS are promulgated to protect human health with an adequate margin of safety (see Clean Air Act 109(b) and 40 CFR 50.2).

investigation determined that substantial information exists to answer these questions, and neither asbestos nor radioactive materials are present in the ore body above typical background concentrations.

3.6.3 Affected Environment

3.6.3.1 Relevant Laws, Regulations, Policies, and Plans

A wide range of Federal, State, and local requirements regulate air quality impacts of mine operations. Many of these require permits before the mine operations begin; others may require approvals or consultations, mandate the submission of various reports, and/or establish specific prohibitions or performance-based standards (Newell et al. 2018; U.S. Forest Service et al. 2010).

Primary Legal Authorities Relevant to the Air Quality Effects Analysis

- Pinal County has been delegated responsibility under the Clean Air Act, and County, State, and Federal air quality regulations would be met through issuance of a Class II air permit (West Pinal PM_{10} Moderate Nonattainment Area, Chapter 4 Article 1 of the PCAQCD Code of Regulations)
- Additional Forest Service guidance for air-quality related values (deposition and visibility) contained in U.S. Forest Service et al. (2010)
- General Conformity Rule (Clean Air Act Section 176(c)(4); implanted in 40 CFR 93); applicable only to Alternatives 5 and 6

3.6.3.2 Existing Conditions and Ongoing Trends

Resolution Copper conducted air quality and meteorological monitoring at the proposed project area. The locations of the monitors are shown in figure 3.6.2-1. Particulate matter (PM_{10} and $PM_{2.5}$) has been monitored at the West Plant monitoring site and the East Plant monitoring site. Nitrogen dioxide (NO_2), SO_2, and ozone have been monitored at the East Plant Site. The results of the Resolution Copper air quality monitoring program are shown in figure 3.6.3-1, along with the applicable ambient standards. The data show some year-to-year variability, but there is no evident trend, except for the 1-hour SO_2 levels.

All monitoring data show compliance with the applicable standards, except potentially for ozone (the 3-year average, eighth highest daily maximum ozone level, is used to evaluate compliance with the standard). The arithmetic average of the last 3 years of ozone monitoring is 0.072 parts per million (ppm) (truncated), which is above the current ambient standard of 0.070 ppm. The data show the variability over the 5-year period and include relatively high PM_{10} and $PM_{2.5}$ levels in 2013. Although there is no distinct trend except for the annual $PM_{2.5}$ at the West Plant Site, the West Plant Site shows an annual average increase of 0.4 micrograms per cubic meter ($\mu g/m^3$) per year in $PM_{2.5}$ concentrations over the monitoring period. The hourly NO_2 and SO_2 levels have steadily declined over this period, until 2017.

Resolution Copper collected meteorological data at three sites near the proposed mine operations, including the East Plant Site, West Plant Site, and Near West location, and used data from 2 years (2015–2016) to conduct the near-field air quality impact analysis. The data include wind speed, wind direction, stability category, and temperature. The data show a strong prevailing wind pattern at all sites with the dominant prevailing wind from the northeast quadrant for the East Plant Site and West Plant Site, and from the southeast quadrant for the Near West location. A secondary prevailing wind from the west and southwest is evident at all sites.

Conformity

The General Conformity Rule was established under Clean Air Act Section 176(c)(4) and implemented in 40 CFR 93; it serves to ensure

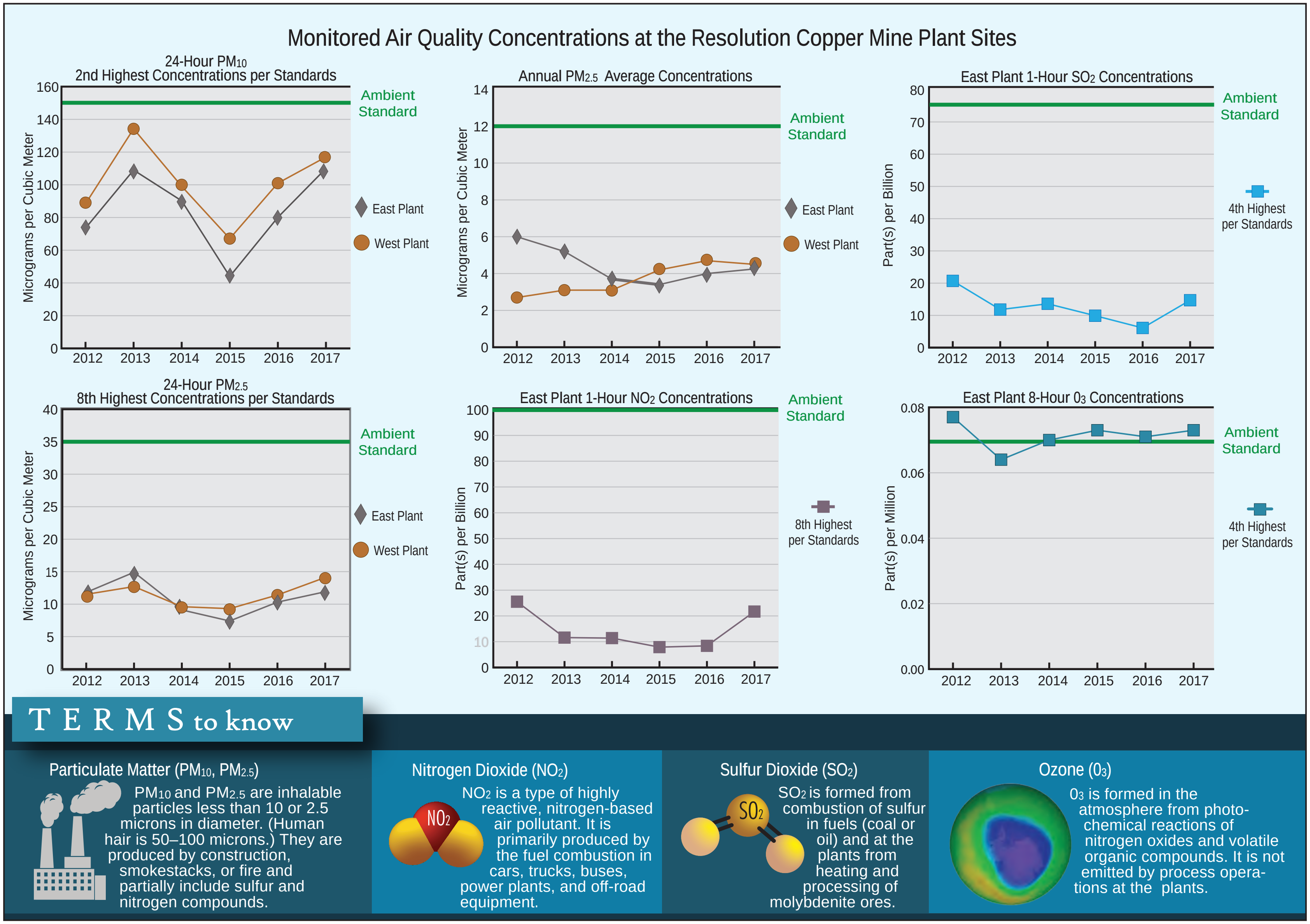


Figure 3.6.3-1. Monitoring results for PM_{10}, $PM_{2.5}$, NO_2, SO_2, and ozone relative to standards under 40 CFR 50

that Federal actions do not inhibit State attainment plans for areas designated as non-attainment or maintenance. The rule effectively applies to all Federal actions that take place in areas designated as non-attainment or maintenance. The near-field project analysis area is located within three counties (Pinal, Maricopa, and Gila Counties, Arizona). The East Plant Site would be partially located in the Hayden PM_{10} Nonattainment Area and the filter plant and loadout facility would be located in the West Pinal PM_{10} Nonattainment Area.

The Forest Service has determined that a conformity analysis for this area is not warranted for the alternatives in or near these two Nonattainment Areas (Newell et al. 2018). At the time of publication of the DEIS, the ADEQ is petitioning the EPA to have the Hayden PM_{10} area designated as Attainment, based on the fact that ambient concentrations have not exceeded the standards for several years (Arizona Department of Environmental Quality 2018b). In addition, modeling results (Air Sciences Inc. 2018c) demonstrate that the impacts from the proposed alternatives do not exceed the ambient air quality standards. The filter plant and loadout facility would be located within the West Pinal PM_{10} Nonattainment Area, but a formal General Conformity analysis would not be required for this Nonattainment Area, for reasons including that PM_{10} emissions are well below the 100 tons/year threshold, and dispersion modeling demonstrates that PM_{10} impacts around this facility are well below the applicable standard.

Regional Climatology

The regional climate is characterized as semiarid; there are often long periods with little or no precipitation (Western Regional Climate Center 2018). Precipitation falls in a bimodal pattern: most of the annual rainfall within the region occurs during the winter and summer months, with dry periods mainly in the spring and fall. The total average annual precipitation varies between 15.7 inches and 18.8 inches, with 52 percent of the precipitation falling between November and April. Although there may be snow at higher elevations, it does not typically accumulate in the region. Precipitation usually occurs with steady, longer duration frontal storm events during the winter months (December through March). Rain events during the summer months (July to early September) are typically of shorter duration with more intensity associated with thunderstorms.

3.6.4 Environmental Consequences of Implementation of the Proposed Mine Plan and Alternatives

3.6.4.1 Alternative 1 – No Action

Under the no action alternative, there would be no impacts on air quality from proposed mining and associated activities. Existing and ongoing impacts on air quality from fugitive dust and vehicle emissions are expected to increase over time with continued population growth in central Arizona. However, it is expected that monitoring and remedial actions by Maricopa County, Pinal County, and ADEQ would be effective in keeping these gradual changes within NAAQS.

3.6.4.2 Direct and Indirect Effects Common to All Action Alternatives

Effects of the Land Exchange

The land exchange would have limited effects on air quality. The Oak Flat Federal Parcel would leave Forest Service jurisdiction; no significant effects are expected. However, the Tonto National Forest would lose its authority to provide direction and support to management activities in order to meet minimum air standards.

The offered lands parcels would enter either Forest Service or BLM jurisdiction, allowing those agencies to secure authority over management activities pertaining to air quality. However, it is important to note that the air quality currently existing within the offered lands parcels is unlikely to experience significant change after transfer to Federal jurisdiction. These parcels are primarily inholdings of surrounding Forest Service– or BLM-managed lands and likely reflect air quality of the surrounding areas that are already managed to achieve these air quality standards.

Effects of Forest Plan Amendment

The Tonto National Forest Land and Resource Management Plan (1985b) provides guidance for management of lands and activities within the Tonto National Forest. It accomplishes this by establishing a mission, goals, objectives, and standards and guidelines. Missions, goals, and objectives are applicable on a forest-wide basis. Standards and guidelines are either applicable on a forest-wide basis or by specific management area.

A review of all components of the 1985 forest plan was conducted to identify the need for amendment due to the effects of the project, including both the land exchange and the proposed mine plan (Shin 2019). One standard and guideline was identified applicable to air quality. This standard and guideline was found to not require amendment to the proposed project, either on a forest-wide or management area–specific basis. For additional details on specific rationale, see Shin (2019).

Summary of Applicant-Committed Environmental Protection Measures

A number of environmental protection measures are incorporated into the design of the project that would act to reduce potential impacts on air quality. These are non-discretionary measures, and their effects are accounted for in the analysis of environmental consequences.

From the GPO (Resolution Copper 2016d), Resolution Copper has committed to a variety of measures to reduce potential impacts on air quality:

- Dust control on roads, including regular watering, road base maintenance and dust suppression, paving select access roads to the East Plant Site and West Plant Site with asphalt, and setting reasonable speed limits on access roads within the operational footprint.
- Dust control at the tailings storage facility, including delivering tailings to the storage facility via distribution pipelines and continuously wetting the tailings during active deposition. During non-active periods, dust emissions would be managed by establishing a temporary vegetative cover on construction areas that would be inactive and exposed for longer than 12 months, wetting inactive beaches and embankment surfaces with irrigation from sprinkler systems, and treatment with chemical or polymer dust suppressants, if necessary.
- Dust control at East Plant Site, including periodic water and/or chemical dust suppressant, normal mining controls such as wet drilling and the wetting of broken rock, application of water suppression spray to control dust ore conveyance, dedicated exhaust ventilation systems and/or enclosures for crushers and transfer points underground, performing primary crushing and conveying underground, and saturating underground exhaust ventilation.
- Dust control at West Plant Site, including housing main active ore stockpiles in fully covered buildings, applying water suppression spray to control dust ore conveyance, processing ore in a new enclosed building, and enclosing conveyor transfer points within the concentrator building.
- Dust control during shipping, including bagging molybdenum concentrate at the concentrator facility before shipping and enclosing loadout building and storage shed.

Other applicant-committed environmental protection measures by Resolution Copper include those outlined in the “Final Air Quality Impacts Analysis Modeling Plan” (Air Sciences Inc. 2018a) and Resolution Copper’s current air quality permit, including the following:

- Use of low-sulfur diesel in mobile and stationary equipment;
- Use of a scrubber to control SO_2 emissions from the drying of molybdenum concentrate at the West Plant Site;
- Use of Tier 4 diesel engines (or greater); and

- Use of fencing, berms, locking gates, signage, natural barriers/ steep terrain (25 to 30 percent or greater), and site security measures to limit access roads and other locations near areas of heavy recreational use. These same methods would be required to limit public access within the mine site (i.e., the air modeling boundary) to prevent public exposure to mine emissions.

Air Quality Impact Assessment

The dispersion modeling effort described in section 3.6.3 is used to characterize ambient air quality impacts at receptors in the area of each of the proposed facilities (East Plant Site, West Plant Site, filter plant, and loadout facility), as well as the alternative tailings storage facility locations. Air Sciences generated a composite receptor grid of the impacts from the separate model runs for these facilities and used the grid to evaluate impacts; in other words, the emissions from each facility were modeled separately but then combined to assess impacts. The maximum impact for each of the criteria air pollutants over the composite receptor grid determines the direct effects of the proposed action and the alternatives. The impacts include the model results of emissions from the proposed action and alternatives added to a "background" air quality value that represents the ongoing impacts from other sources (including natural sources) in the area, and in effect represents the cumulative impact of the proposed action and other sources (Air Sciences Inc. 2018b). The background concentrations are based in part on the Resolution Copper data from the monitoring sites (see figure 3.6.3-1). These impacts are then compared with the appropriate standard, some of which have specific time components (i.e., 8-hour average). Details of the analysis are provided in Air Sciences (2018c).

Results of the modeled maximum impacts at all receptors for each of the criteria air pollutants are shown in table 3.6.4-1 for the proposed action (Alternative 2 – Near West Proposed Action). The emissions from the mining and processing operations at the East Plant Site, West Plant Site, and tailings storage facility boundary are taken from the year of maximum ore production (year 14) and added to the impacts from the maximum erodible area for the affected tailings storage facility.[31] Annual impacts are based on the annual average emission rate for each source; maximum hourly impacts are based on the hourly maximum emission rate for all sources; and 24-hour maximum impacts are based on the maximum 24-hour emission rate for the sources. None of the predicted results are anticipated to exceed the NAAQS at the ambient air boundary/fence line.

Air quality impacts were modeled for each alternative, but the results are largely the same. Maximum impacts for other alternatives would be very similar to those shown in table 3.6.4-1. Detail of the results of other alternative air quality modeling are contained in Newell et al. (2018).

For all alternatives, the maximum total impacts for carbon monoxide (CO), 1-hour NO_2, and short-term SO_2 (24 hours or less) would occur at or near the boundary of the East Plant Site due to the large number of combustion sources at that site. The maximum annual impacts for NO_2 would occur at the filter plant and loadout facility and the maximum annual SO_2 impacts would occur at the West Plant Site, although both impacts would be well below the applicable ambient air quality standards.

As can be noted from table 3.6.4-1, maximum 1-hour NO_2 impacts would be about 78 percent of the standard, based on the average of the daily maximum 1-hour 98th percentile value over a 2-year period. Figure 3.6.4-1 shows the maximum impact for the 1-hour NO_2 design value at receptors around the East Plant Site and West Plant Site for

31. For the tailings facilities, the largest source of contaminants is fugitive dust, which largely depends on the amount of ground disturbed and exposed to wind. Therefore, assuming the largest exposed area—even at years before buildout occurs—ensures that air quality impacts are not underestimated.

Table 3.6.4-1. Maximum air quality impacts for proposed operations and Alternative 2 – Near West Proposed Action

Pollutant	Model Result/Form of Standard	Proposed Action Impact Only (µg/m³)	Background (µg/m³)	Total Maximum Impact (µg/m³)	Standard (µg/m³)	Total Maximum Impact as a Percentage of Standard
CO_1H	3rd high over 2 years	4,531	3,550	8,081	40,500	20
CO_8H	3rd high over 2 years	1,040	2,519	3,559	10,000	36
NO_2_1H	98th percentile over 2 years	138	9	146	188	78
NO_2_AN	Max annual over 2 years	2	3	5	100	5
PM_{10}_24H	3rd high over 2 years	26	71	97	150	65
PM_{10}_AN*	Max annual over 2 years	7	17	25	50	49
PM_{25}_24H	98th percentile over 2 years	11	6	18	35	51
PM_{25}_AN	Average annual over 2 years	2	4	6	12	49
SO_2_1H	99th percentile over 2 years	92	24	117	196	59
SO_2_3H	2nd high over 2 years	56	31	86	1,300	7
SO_2_24H*	2nd high over 2 years	9	11	20	365	6
SO_2_AN*	Max annual over 2 years	1	2	3	80	4

Note: µg/m³ = micrograms per cubic meter
* Not a Federal standard

Alternative 2 – Near West Proposed Action.[32] The overall maximum would occur at the ambient air boundary of the East Plant Site, with the relatively higher values toward the north and east of the East Plant Site. Predicted impacts are reduced substantially with distance from the East Plant Site ambient air boundary. The impacts are analyzed and depicted on a nested grid of receptors (see figure 3.6.4-1).

The maximum design value 24-hour average impacts for $PM_{2.5}$ would occur at the eastern boundary of the East Plant Site, as shown in figure 3.6.4-2 (also for Alternative 2 – Near West Proposed Action). The maximum 24-hour average impacts, as well as the annual average impacts for $PM_{2.5}$ and PM_{10}, occur at or near the boundaries of the East Plant Site, West Plant Site, and tailings storage facility. The predicted highest impacts tend to be captured within the 100-m grid spacing, within 1 km of the ambient air boundary. Impacts at most of the receptors around the East Plant Site and other project sites would be less than one-half of the design value ambient standard.[33] Maximum $PM_{2.5}$

32. In figures 3.6.4-1 and 3.6.4-2, the impacts are analyzed and depicted on a nested grid, with a sub-grid of receptors at 100-m spacing out to 1 km from the ambient air boundary, a 500-m grid spacing from 1 km to 5 km from the boundary, nested 1,000-km and 2,500-km grid spacing beyond that distance, and 25-m receptors along the ambient air boundaries and nearby roadways. The more densely nested 100-m sub-grid is clearly depicted in the figure, and the higher impacts are captured largely within this sub-grid of receptors.

33. The design value of the ambient air quality standard refers to the calculation of compliance with the standard. For example, the design value of the 1-hour NO_2 standard is the 3-year average of the annual 98th percentile of the highest daily 1-hour ozone concentration.

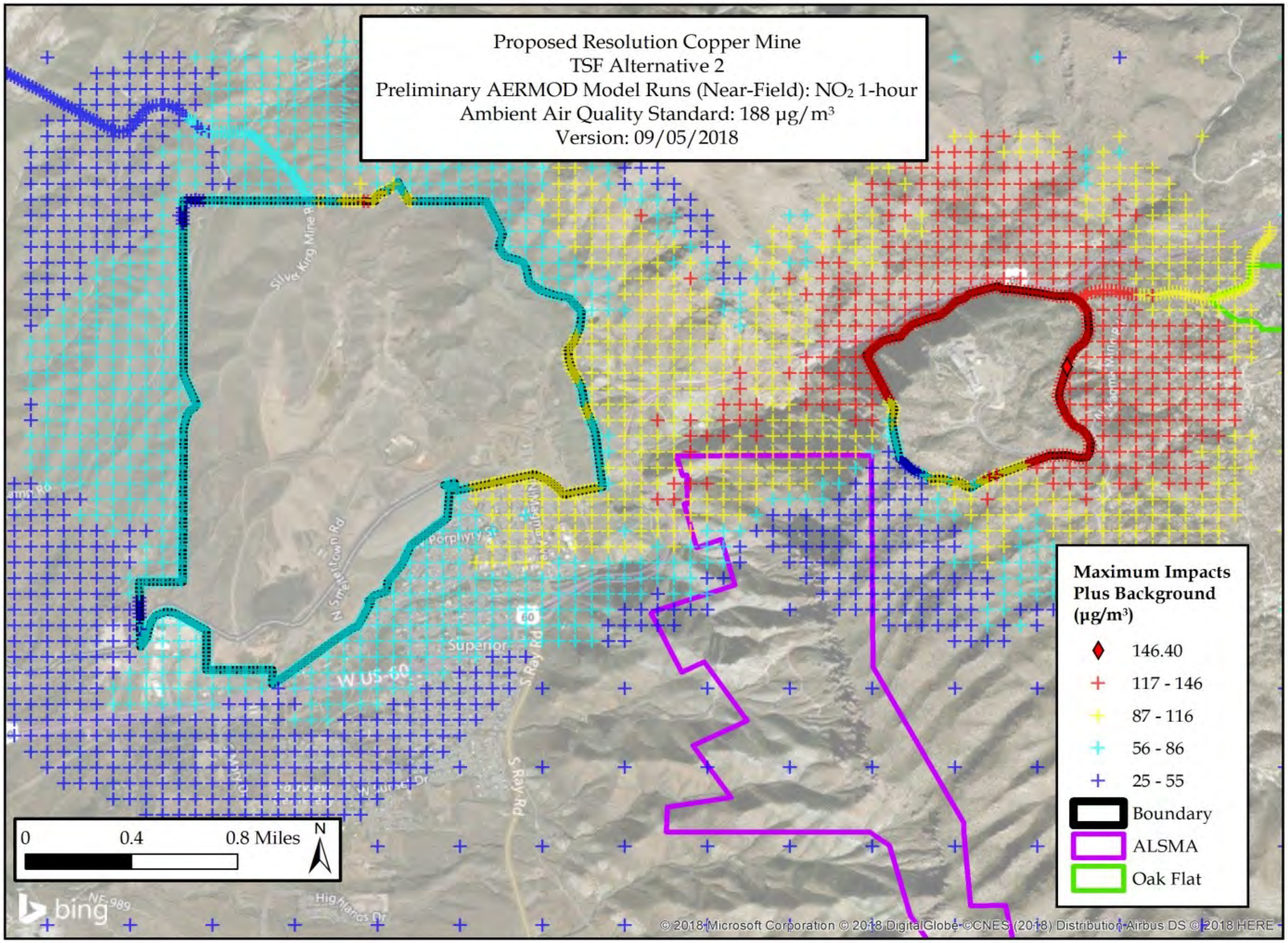


Figure 3.6.4-1. Maximum 1-hour 98th percentile NO_2 impacts at receptors near East Plant Site and West Plant Site for Alternative 2 – Near West Proposed Action

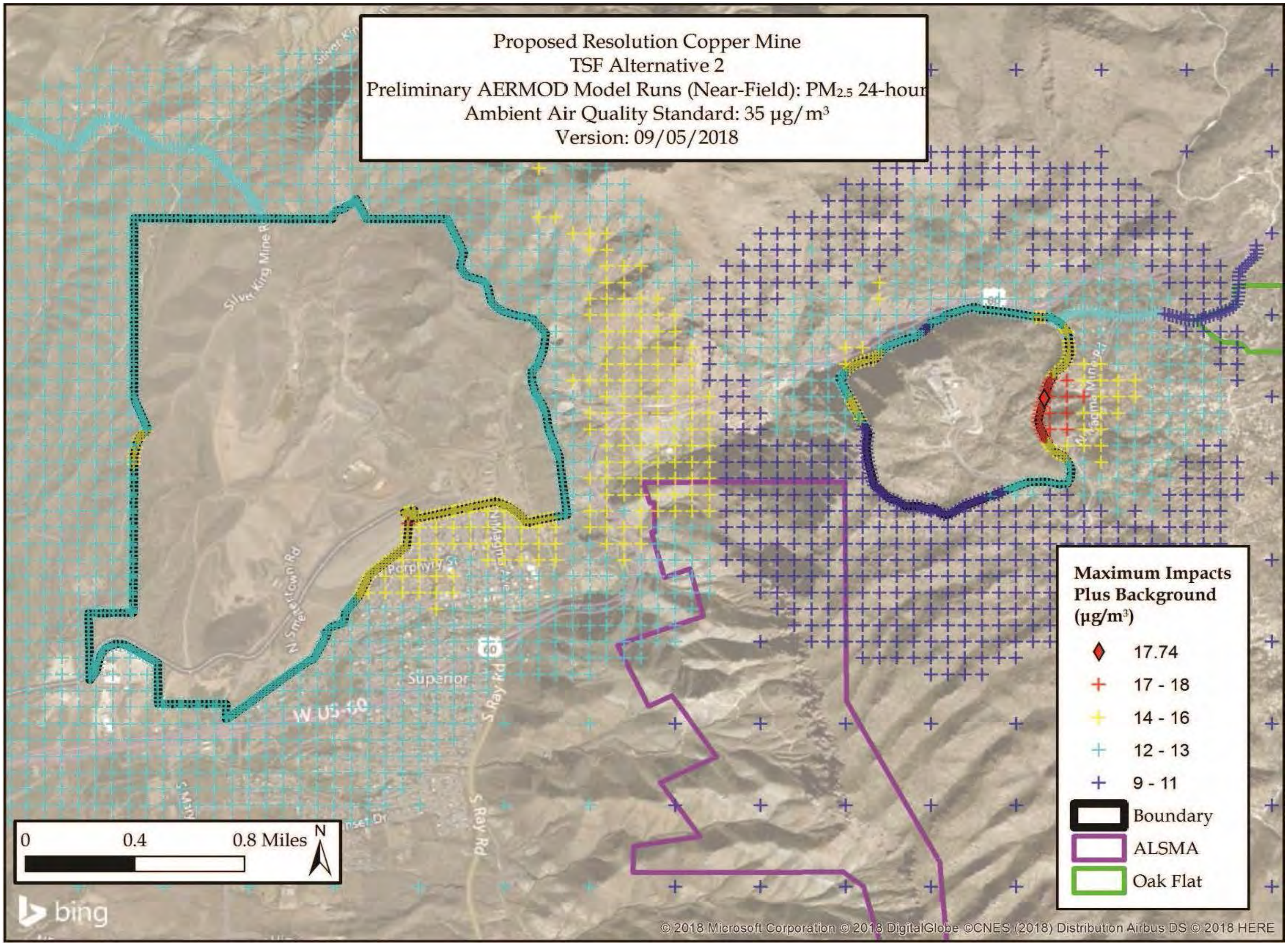


Figure 3.6.4-2. Maximum 24-hour 98th percentile $PM_{2.5}$ impacts at receptors near the tailings storage facility for Alternative 2 – Near West Proposed Action

impacts for the other alternatives are equivalent to Alternative 2, and are also located around the East Plant Site boundary.

A separate analysis of ozone formation and secondary $PM_{2.5}$ formation was conducted (Air Sciences Inc. 2018c) based on total emissions using the thresholds provided by the EPA (2017). Results indicate that the maximum impacts would be below the established thresholds of impact for both of these pollutants, as provided by the guidance. The calculated secondary $PM_{2.5}$ would be 0.23 $\mu g/m^3$ for the 24-hour maximum impact and 0.008 $\mu g/m^3$ for the maximum annual impact. Adding these results to the calculations for primary $PM_{2.5}$ impacts would not change the data that are provided in table 3.6.4-1.

Impacts at Sensitive Areas

As designated during the scoping process, the Forest Service identified specific sensitive areas that include Class I areas and Areas of Critical Environmental Concern (ACECs). Areas within 50 km of the proposed action are modeled using the AERMOD platform, and areas from 50 to 100 km are analyzed using the CALPUFF modeling platform. These models use different characterizations to conduct the analyses (see Air Sciences (2018c)).

Table 3.6.4-2 provides the projected maximum incremental air quality impact for any of the alternatives at all receptors in each designated area. Representative background concentrations were not added to the modeled impacts. The analysis focuses on determining whether impacts at the Class I areas and sensitive Class II areas are of concern, and since the air quality impacts are below established significance levels, additional analysis with background concentrations is not warranted. Among the alternatives, and all the Class I areas, the impacts from Alternative 4 are greatest at the Superstition Wilderness, but they remain well below the PSD increments. Impacts represent the maximum among the alternatives; impacts for the other alternatives are less than the reported value and may be below 50 percent of that impact.

All impacts are projected to be less than the PSD increments at the Class I areas and, except for the Superstition Wilderness, would have an insignificant[34] impact at those areas. The highest 24-hour impacts of PM_{10} and $PM_{2.5}$ emissions on air quality at the Superstition Wilderness consume up to 50 percent of the Class I PSD increments for those standards but are well below ambient standards, when background concentrations are added. Impacts are greatest at the area boundary and decrease rapidly with distance toward the remainder of the area. All ambient air quality impacts at the (Class II) White Canyon ACEC are well below the Class II PSD increments. The maximum impacts at this area are for $PM_{2.5}$; PM_{10} is 8 percent of the PSD Class II increments.

Impacts on the deposition of nitrogen (N) and sulfur (S) from the proposed action have also been projected through the same modeling platforms. Impacts are compared with the designated Deposition Analysis Thresholds (DAT) (U.S. Forest Service et al. 2011). The DAT value for S is 5 grams/hectare/year (g/ha/year) and for N is 10 g/ha/year. Results for the maximum deposition at each area among all the alternatives are provided in table 3.6.4-3, for both the S and N deposition estimates for the proposed action. There is little difference among the impacts of the alternatives at each of the sensitive areas.

Visibility impacts are analyzed separately depending on the distance from the source of emissions. Within 50 km, impacts on plume blight[35] at the Superstition Wilderness and the White Canyon ACEC are based on designated vistas within those areas. The impacts are generated under the PLUVUE II analysis (U.S. Environmental Protection Agency 1992), which focuses on a single plume and is analyzed only for meteorological conditions during daylight hours. The analysis is directionally dependent, and where appropriate a representative characterization of the 24-hour emissions of SO_2, NO_X, and PM_{10} were combined into a single

34. Comparisons with the PSD Class I Significant Impact Levels are provided for information only. No formal further analysis is required because the proposed action and alternatives do not trigger review and approval under the PSD regulations.

35. Plume blight is a visual impairment of air quality that manifests itself as a coherent plume.

Table 3.6.4-2. Maximum ambient air quality impacts at identified sensitive areas

	Class I Areas						Class II Areas		
Pollutant / Standard*	**PSD Class I Increment (µg/m³)**	**Superstition Wilderness (µg/m³)**	**Sierra Ancha Wilderness (µg/m³)**	**Mazatzal Wilderness (µg/m³)**	**Galiuro Wilderness (µg/m³)**	**Saguaro National Park (µg/m³)**	**PSD Class II Increment (µg/m³)**	**White Canyon ACEC† (µg/m³)**	**Needle's Eye Wilderness† (µg/m³)**
NO_2_AN	**2.5**	0.109	0.007	0.008	0.009	0.010	**25**	0.60	0.011
PM_{10}_24H	**8.0**	4.26	0.463	0.394	0.476	0.793	**30**	2.46	0.454
PM_{10}_AN	**4.0**	0.318	0.018	0.020	0.027	0.028	**17**	0.168	0.030
$PM_{2.5}$_24H	**2.0**	1.57	0.123	0.125	0.139	0.173	**9**	0.834	0.146
$PM_{2.5}$_AN	**1.0**	0.119	0.006	0.009	0.007	0.008	**4**	0.053	0.010
SO_2_3H	**25**	4.41	0.380	0.294	0.251	0.340	**512**	2.55	0.334
SO_2_24H	**5**	0.994	0.080	0.076	0.053	0.054	**91**	0.478	0.066
SO_2_AN	**2**	0.008	0.002	0.001	0.003	0.002	**20**	0.023	0.003

Notes: µg/m³ = micrograms per cubic meter; shaded columns show standard for comparison for the Class I and Class II areas evaluated in this table
* See table 3.6.4-1 for more detail on specific standards
† PSD Class II Increments apply to White Canyon ACEC and Needle's Eye Wilderness

Table 3.6.4-3. Maximum deposition analysis impacts at sensitive areas

Constituent	DAT Value (g/ha/year)	Superstition Wilderness (g/ha/year)	White Canyon ACEC (g/ha/year)	Sierra Ancha Wilderness (g/ha/year)	Mazatzal Wilderness (g/ha/year)	Galiuro Wilderness (g/ha/year)	Saguaro National Park (g/ha/year)	Needle's Eye Wilderness (g/ha/year)
Sulfur	5	1.42	0.77	0.16	0.10	0.05	0.02	0.22
Nitrogen	10	4.18	2.94	0.33	0.19	0.15	0.05	1.06

Note: g/ha/year = grams per hectare per year plume. Results are provided for each of the observer locations in the two areas in table 3.6.4-4, indicating the number of daylight hours per year that a plume is perceptible at the indicated vistas for Alternatives 2 and 3. Perceptibility is based on the absolute contrast threshold, |C|, of 0.02 and a color contrast for gray terrain, ΔE, of 1.0 (figure 3.6.4-3).

Over the extended areas, the visibility of a plume against terrain features is affected by the height of the terrain and the position of the observer. The frequencies reported represent a general characterization of plume impacts when viewing terrain; there would be generally a 2 to 6 percent probability of a visible plume during daylight hours in the Superstition Wilderness. The impact at any one location could be different based on the terrain and the distance of the plume from the source(s). The plume may be visible in one direction but not in the opposite direction, for example. The frequency of a visible plume impact against the blue sky, however, would generally decrease with farther distances from the source(s). The effect or frequency of cloudy conditions is not taken into account in this analysis.

Beyond 50 km, visibility impacts are predicted based on regional haze, which is a general condition in the impact area based on maximum concentrations of the impacts at those areas. Data for SO_2, NO_X, sulfates, and nitrates are used to evaluate these impacts. Annual average natural conditions are added to the predicted impacts that would occur from the proposed action. Results are shown in table 3.6.4-5 for the highest 98th percentile of the daily percent of extinction among the alternatives. A threshold value of 5 percent from a single source is considered a significance threshold for conducting an additional impact analysis, and a 10 percent cumulative impact is considered a perceptible impact. All impacts are well below the 5 percent threshold that requires further analysis, demonstrating that impacts on regional haze at these locations would not be perceptible for any of the alternatives.

The analysis of air quality impacts for the proposed action and alternatives shows that all impacts would be within the ambient air quality standards and well below the PSD increments. The proposed emission sources would comply with applicable regulations, and impacts

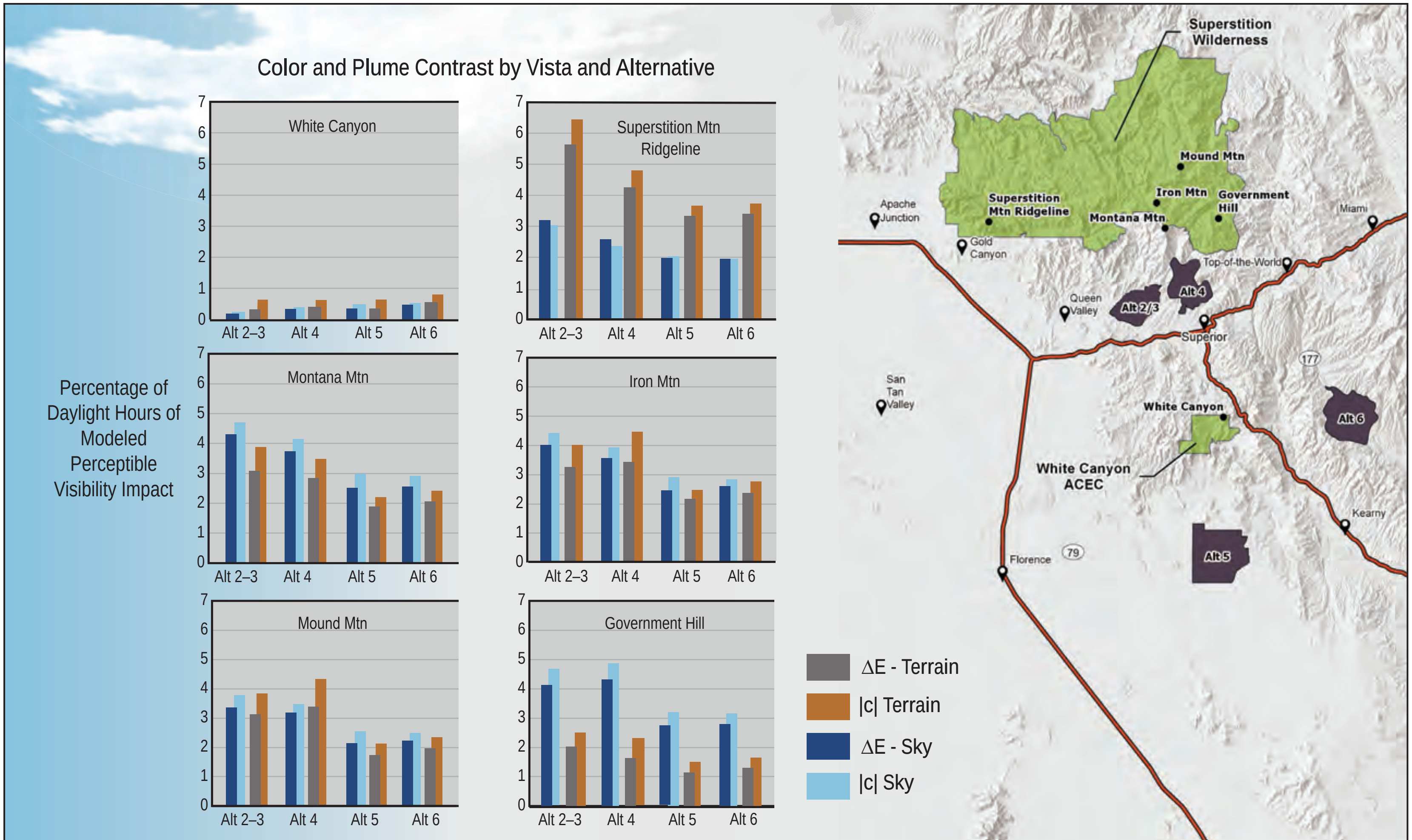
Table 3.6.4-4. Annual total and percentage of daylight hours of perceptible plume blight at observer locations in sensitive areas, Superstition Wilderness, and White Canyon ACEC

Observer Location	|C| Sky	ΔE Sky	|C| Terrain	ΔE Terrain
Montana Mountain (Superstition Wilderness)	206 (4.7%)	189 (4.3%)	170 (3.9%)	136 (3.1%)
Government Hill (Superstition Wilderness)	204 (4.7%)	182 (4.1%)	110 (2.5%)	89 (2.0%)
Iron Mountain (Superstition Wilderness)	194 (4.4%)	177 (4.0%)	177 (4.0%)	143 (3.3%)
Mound Mountain (Superstition Wilderness)	166 (3.8%)	147 (3.4%)	169 (3.8%)	138 (3.1%)
Superstition Mountain ridgeline (Superstition Wilderness)	133 (3.0%)	141 (3.2%)	283 (6.4%)	248 (5.6%)
White Canyon (White Canyon ACEC)	11 (0.2%)	9 (0.2%)	28 (0.6%)	14 (0.3%)

Note: There is a total of 4,386 hours of daylight per year.

Table 3.6.4-5. Impacts of 98th percentile daily regional haze extinction levels in Class I areas

Affected Area	Proposed Action (%)
Threshold	**5**
Sierra Ancha Wilderness	0.35
Mazatzal Wilderness	0.15
Galiuro Wilderness	0.16
Saguaro National Park	0.17



TERMS to know

Color Contrast Parameter (ΔE)

Probably best single indicator of the perceptibility of a plume both to its contrast and its color with respect to a viewing background. Calculated for the entire visible spectrum and indicates how different the brightness and color of plume and background are.

Plume Contrast (|c|)

Relative brightness of a plume compared to a viewing background. Positive contrast indicates a relatively bright plume; negative contrast indicates a dark plume.

Figure 3.6.4-3. Near-field visibility of plume blight based on the absolute contrast threshold, |C|, of 0.02 and a color contrast for gray terrain, ΔE, of 1.0

on air quality-related values would be within the established thresholds for levels of acceptability.

3.6.4.3 Cumulative Effects

The Tonto National Forest identified the following reasonably foreseeable future actions as likely, in conjunction with development of the Resolution Copper Mine, to contribute to cumulative impacts on air quality in the "near field" vicinity of the proposed Resolution Copper Mine and its project alternative component locations (e.g., tailings facilities) as well as at more distant, or "far field," locations in much of Pinal County, Gila County, and Maricopa County (see figure 3.6.2-1). As noted in section 3.1, past and present actions are assessed as part of the affected environment; this section analyzes the effects of any RFFAs, to be considered cumulatively along with the affected environment and Resolution Copper Project effects.

- *Pinto Valley Mine Expansion.* The Pinto Valley Mine is an existing open-pit copper and molybdenum mine located approximately 8 miles west of Miami, Arizona, in Gila County. Pinto Valley Mining Corporation is proposing to expand mining activities onto an estimated 1,011 acres of new disturbance (245 acres on Tonto National Forest land and 766 acres on private land owned by Pinto Valley Mining Corporation) and extend the life of the mine to 2039. This proposed expansion would foreseeably result in construction-related vehicle exhaust emissions (including NO_2, SO_2, and diesel-generated particulate matter) as well as potential increases in airborne particulate matter through large-scale earthmoving, wind effects on newly disturbed and exposed ground, and other activities. However, no data are available at this time to determine how these potential future increases may cumulatively affect overall air quality in the analysis area.
- *Ripsey Wash Tailings Project.* Mining company ASARCO is planning to construct a new tailings storage facility to support its Ray Mine operations. The environmental effects of the project were analyzed in an EIS conducted by the USACE and approved in a ROD issued in December 2018. As approved, the proposed tailings storage facility project would occupy an estimated 2,574 acres and be situated in the Ripsey Wash watershed just south of the Gila River approximately 5 miles west-northwest of Kearny, Arizona, and would contain up to approximately 750 million tons of material (tailings and embankment material). ASARCO estimates a construction period of 3 years and approximately 50 years of expansion of the footprint of the tailings storage facility as slurry tailings are added to the facility, followed by a 7- to 10-year period for reclamation and final closure. An air quality analysis conducted for the EIS found the project to be in conformance with the Clean Air Act (i.e., with no exceedances of criteria pollutant thresholds) and also with the relevant State Implementation Plan. The Ripsey Wash tailings storage facility is intended to replace the existing Ray Mine Elder Gulch tailings storage facility, which would be phased out and closed as the Ripsey Wash facility becomes operational; any additive cumulative effects are thus considered negligible.
- *Ray Land Exchange and Proposed Plan Amendment.* ASARCO is also seeking to complete a land exchange with the BLM by which the mining company would gain title to approximately 10,976 acres of public lands and federally owned mineral estate located near ASARCO's Ray Mine in exchange for transferring to the BLM approximately 7,304 acres of private lands, primarily in northwestern Arizona. It is known that at some point ASARCO wishes to develop a copper mining operation in the "Copper Butte" area west of the Ray Mine; however, no details are currently available as to potential environmental effects, including to air quality, resulting from this possible future mining operation. It should be noted that the Copper Butte area lies within current ADEQ nonattainment areas for ozone, lead, and PM_{10}, and that mining development has the potential to generate additional levels of these criteria pollutants.

- *ADOT Vegetation Treatment.* ADOT plans to conduct annual treatments using EPA-approved herbicides to contain, control, or eradicate noxious, invasive, and native plant species that pose safety hazards or threaten native plant communities on road easements and NFS lands up to 200 feet beyond road easement on the Tonto National Forest. It can be reasonably assumed that ADOT would continue to conduct vegetation treatments along U.S. 60 on the Tonto National Forest during the expected life of the Resolution Copper Mine (50 to 55 years) for safety reasons. Activity and traffic could contribute marginally to fugitive dust in the area but would not result in any substantial change when considered with Resolution Copper Project air quality impacts.
- *Tonto National Forest Travel Management Pla*n. The Tonto National Forest is currently in the process of developing a Supplemental EIS to address certain court-identified deficiencies in its 2016 Final Travel Management Rule EIS. This document and its implementing decisions are expected within the next 2 years. The Supplemental EIS currently proposes a total of 3,708 miles of motorized routes open to the public, a reduction from the 4,959 miles of motorized open routes prior to the Travel Management Rule. Limiting availability of motorized routes open to the public would result in reduced access to recreational activities currently practiced on NFS lands, including sightseeing, camping, hiking, hunting, fishing, recreational riding, and collecting fuelwood and other forest products. Such a reduction in miles of available motorized routes should have the effect of leading to overall decrease in emissions and impacts from current levels.

Other mining activity, residential growth, government-sponsored projects and public infrastructure development (including construction of new roadways, electrical transmission lines, and other utilities), agricultural activity, and commercial economic activity is certain to occur in this area of south-central Arizona during the foreseeable future life of the Resolution Copper Mine (50–55 years). Each of these developments may cumulatively contribute to future changes to air quality in the region. Some future expansion or curtailment of presently identified boundaries of nonattainment areas for NAAQS criteria pollutants is also possible, both because of ongoing changes in actual environmental conditions and because the EPA periodically reviews and revises the regulatory standards applicable to these pollutants.

3.6.4.4 Mitigation Effectiveness

The Forest Service is in the process of developing a robust mitigation plan to avoid, minimize, rectify, reduce, or compensate for resource impacts that have been identified during the process of preparing this EIS. Appendix J contains descriptions of mitigation concepts being considered and known to be effective, as of publication of the DEIS. Appendix J also contains descriptions of monitoring that would be needed to identify potential impacts and mitigation effectiveness. As noted in chapter 2 (section 2.3), the full suite of mitigation would be contained in the FEIS, required by the ROD, and ultimately included in the final GPO approved by the Forest Service. Public comment on the EIS, and in particular appendix J, will inform the final suite of mitigations. At this time, no mitigation measures have been identified that would be pertinent to air quality concerns. Applicant-committed environmental protection measures have already been detailed elsewhere in this section, will be a requirement for the project, and have already been incorporated into the analysis.

Unavoidable Adverse Effects

For the proposed action and all alternatives, emissions from project-related activities would meet applicable Federal and State standards for air quality but the increase in air pollutant concentrations would constitute impacts that cannot be avoided.

3.6.4.5 Other Required Disclosures

Short-Term Uses and Long-Term Productivity

Impacts on air quality (increased air pollutant concentrations but below applicable air quality standards) from mining and associated activities would be short term (during the estimated 51- to 56-year life of the mine, including construction, operations, and reclamation) and are expected to end with mine reclamation and return to pre-mining levels, assuming adequate revegetation success to stabilize dust emissions from disturbed areas.

Irreversible and Irretrievable Commitment of Resources

During the construction and mining phases of the project, air pollutant concentrations would be higher throughout the analysis area than current levels but within applicable air quality standards; thus, air quality is not impacted for other uses in the airshed and these effects would not be considered irretrievable. Following mine closure and successful reclamation, pollutant concentrations would return to pre-mining levels, and there would be no long-term irreversible commitment of resources.