

Request for Adjustment of the Northern Wasatch Front Nonattainment Area Boundary for the 2015 8-hour Ozone National Ambient Air Quality Standard

Section 107(d)(3)(D) of the Clean Air Act¹ (CAA) states “The Governor of any State may, on the Governor’s own motion, submit to the Administrator a revised designation of any area or portion thereof within the State. Within 18 months of receipt of a complete State redesignation submittal, the Administrator shall approve or deny such redesignation. The submission of a redesignation by a Governor shall not affect the effectiveness or enforceability of the applicable implementation plan for the State.”² Under this authority, the State of Utah is requesting a revision to the boundary of the Northern Wasatch Front (NWF) nonattainment area (NAA) for the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS). This letter includes justification for the requested adjustment including the following elements: historical context of the current boundary, an explanation of regulatory requirements, a description of requested boundary adjustment, the geography and topography of the area, air quality data, an overview of impacted major industrial sources, and scientific findings indicating that the proposed boundary will better represent the airshed of the greater Wasatch Front and improve regulatory and planning efforts to meet current health-based standards.

Current Nonattainment Area Boundary

On December 28, 2015, EPA strengthened the NAAQS for ground level ozone from 75 ppb to 70 ppb.³ Areas of the State of Utah, including the NWF, were subsequently designated as Marginal NAAs because they exceeded the new standard. For the NWF, this included the counties of Salt Lake, Davis, and Weber. Other counties in Utah exceeded the standard as well, but were designated as separate NAAs in marginal status including the Southern Wasatch Front and the Uinta Basin NAAs. The Utah Division of Air Quality (UDAQ) evaluated the counties that exceeded the standard using the following five criteria to determine the most appropriate NAA boundaries: air quality data, meteorology, emissions and emissions related data, jurisdictional boundaries, and geography and topography.⁴ Based on these criteria, UDAQ recommended the NWF NAA include the entirety of Salt Lake and Davis counties, Weber County west of the mountains, as well as a portion of Tooele County that includes the town of Tooele.⁵

At the time of designation, Tooele County had a large percentage of people commuting into violating counties (Salt Lake and Davis), which led to UDAQ’s recommendation that a portion of the county be included in the NAA. In addition to the vehicle emission contributions, monitored data at two sites in Tooele County showed that the area was likely to violate the standard once three consecutive years of data had been collected, with ozone concentrations as high as 72 ppb. Utah’s recommendation for the NWF NAA was also based on the previously designated boundary for the Salt Lake fine particulate matter (PM_{2.5}) NAA⁶, with the exception of Box Elder

¹ Codified at 42 U.S.C. § 7407(d)(3)(D).

² *Id.*

³ 80 Fed. Reg. 65292 (Oct. 26, 2015).

⁴ Utah Area Designation Recommendations for the 2015 8-Hour Ozone NAAQS (Sept. 2016).

⁵ RE: Utah 2015 8-Hour Ozone Designation Recommendation (Sept. 29, 2016).

⁶ 81 Fed. Reg. 58010 (Aug. 24, 2016).

County which was excluded. Box Elder County's exclusion was due to monitored data below the standard for the ozone NAA. Because Volatile Organic Compounds (VOCs) and Oxides of Nitrogen (NO_x) are both precursors to the formation of ozone and PM_{2.5}, EPA and UDAQ determined it was logical that the western edge be expanded to the same boundary as Utah's 2006 PM_{2.5} 24-hr NAAQS nonattainment area.⁷ This recommendation also allowed the state and EPA to implement and enforce controls in a more uniform manner across the Wasatch Front for multiple pollutants. Thus, the current NWF NAA boundary largely rests on the preexisting boundary for PM_{2.5} as determined in 2006. On August 3, 2018, the EPA finalized the classification of several regions of Utah as NAAs for the 2015 8-hour ozone NAAQS.⁸ This rulemaking included the finalization of the boundary for the NWF NAA.

Requested Boundary Adjustment

The State of Utah is requesting a slight modification to the western extent of the current approved boundary. Figure 1 shows the extent of the current boundary and the requested modified boundary. This includes extending the southwestern edge by 7.6 miles to the west and connecting that western edge to the north to meet the boundary of Tooele county over the Great Salt Lake. This modification will result in a more uniform shape which better follows county lines and predominantly adds unoccupied areas consisting of the Great Salt Lake and its surrounding playa, resulting in the addition of 627 square miles to the NWF NAA.

⁷ [EPA's Response to Utah](#) (Dec. 20, 2017).

⁸ 83 Fed. Reg. 25776 (June 4, 2018).

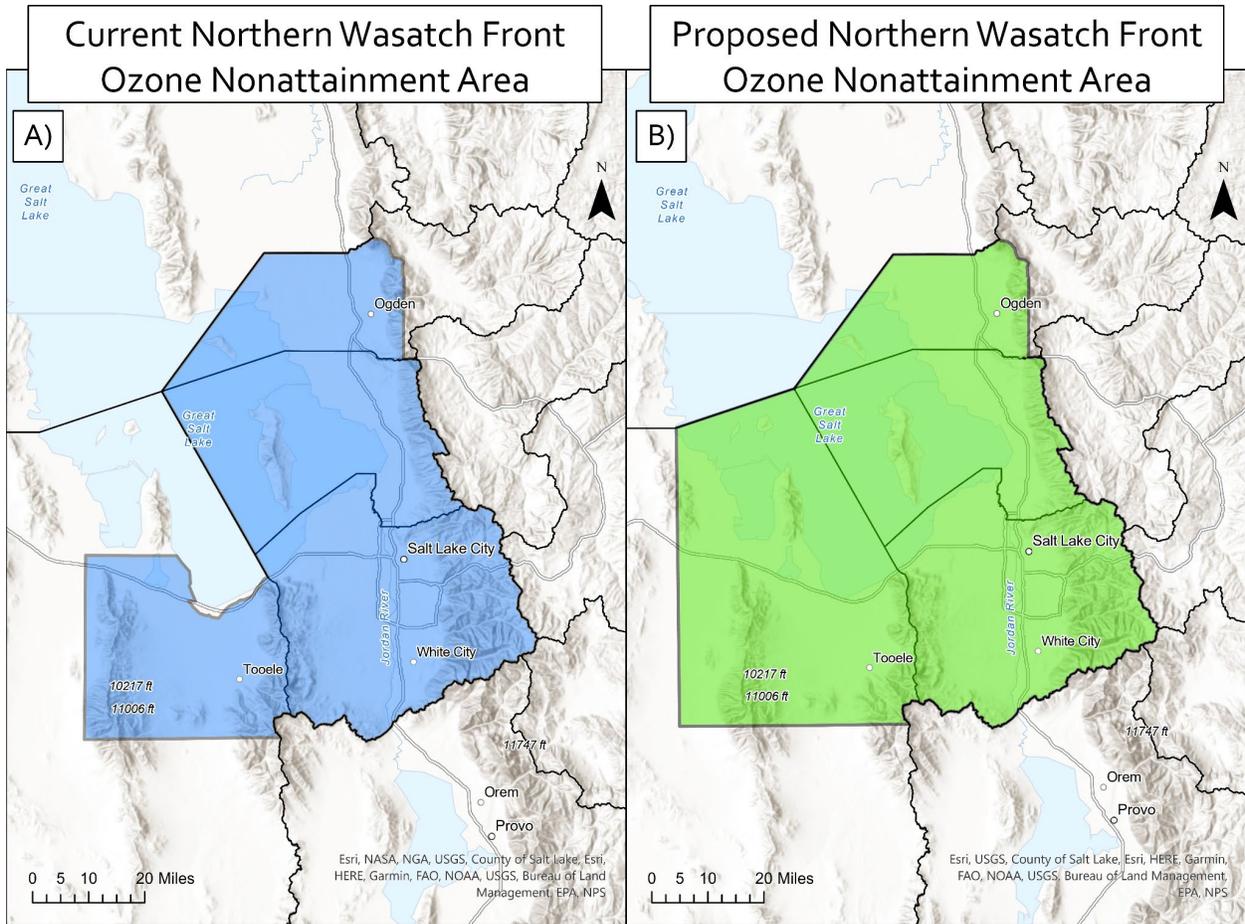


Figure 1: A) Current NWF NAA. B) Proposed NWF NAA.

Geographic and Topographic Considerations

The greater Wasatch Front includes three interconnected valleys that are part of the Intermountain West’s basin and range geological province—Tooele Valley, North Salt Lake Valley, and Salt Lake Valley. These valleys span four counties including Salt Lake, Davis, Weber and Tooele, with the overwhelming majority of the ~1.8 million residents within the NAA residing in the Salt Lake valleys situated along the base of the Wasatch Mountains. The three valleys consist of a variety of complex topography including low and large valleys bordered by steep mountain terrain and a large body of water—the Great Salt Lake.

The proposed new boundary effectively captures the southwestern shore of the Great Salt Lake in Tooele County, an area that shares the same airshed as the rest of the greater Salt Lake metropolitan area. Ozone data from the nearby Erda monitoring station is shown in Table 1 and demonstrates that Tooele County is currently not meeting the 8-hour ozone NAAQS. There are no significant topographic barriers separating this portion of the lake from the rest of the airshed that comprises the NWF NAA, and thus emissions that occur in this region are easily transported into the urbanized regions of the NAA.

Table 1: Ozone Monitoring Data from Tooele County. 8-hr 4th Maximum (ppm)

| Site | ID | AQS # | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|----|-------------|--------|-------|-------|-------|-------|-------|-------|
| Erda | ED | 49-045-0004 | 0.071* | 0.072 | 0.077 | 0.074 | 0.065 | 0.070 | 0.075 |
| *indicate numbers that do not meet the data completeness requirements | | | | | | | | | |

This emissions transport can be seen in Figure 2 and APPENDIX B, in which a HYSPLIT analysis performed by the Utah Division of Air Quality clearly demonstrates that emissions from outside the current boundary are transported to the urban regions of the Wasatch Front in a short period of time, often in under a 24-hour period.

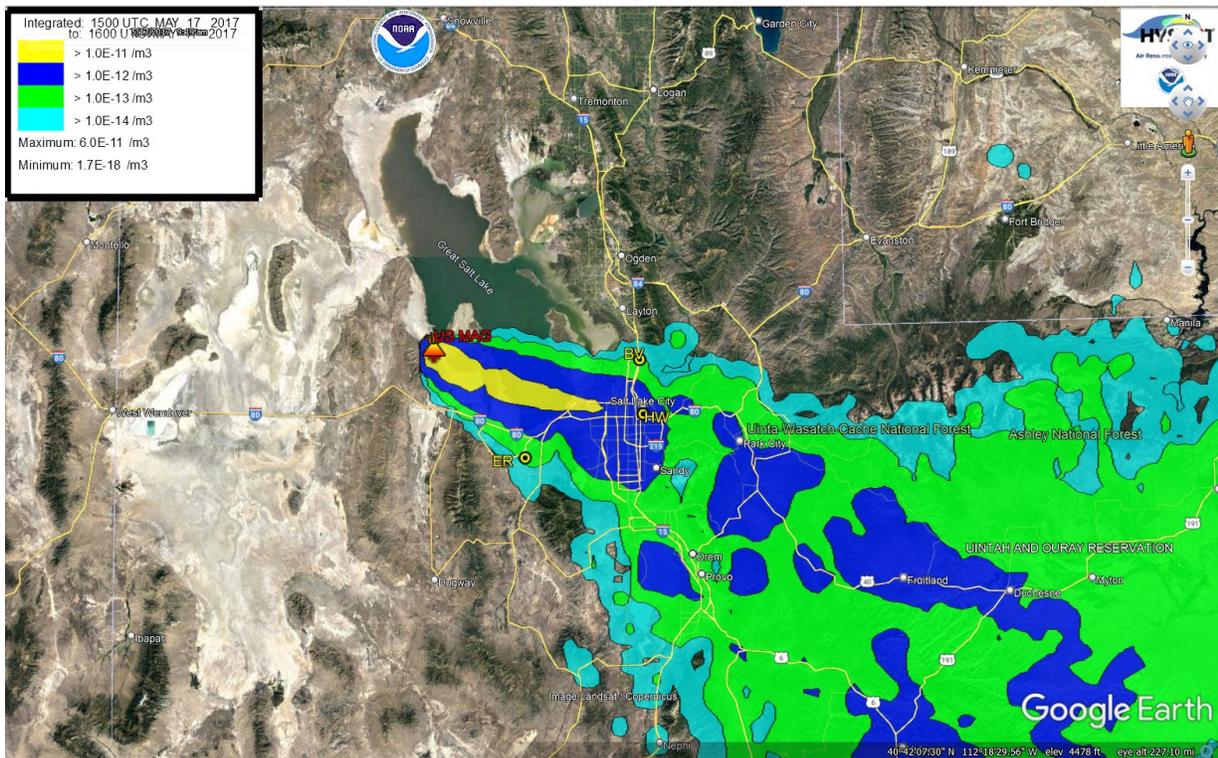


Figure 2: HYSPLIT forward trajectory showing emissions from US Magnesium impacting the Salt Lake Valley on a typical summer day

Impacted Industrial Source

The requested boundary adjustment will result in the inclusion of one additional significant industrial source into the NAA. This source, US Magnesium LLC, is the largest producer of primary magnesium in the US, and operates the Rowley Plant production facility on the western edge of the Great Salt Lake in Tooele County. Here, water from the Great Salt Lake is evaporated to produce a brine solution that is then purified and dried before going through a melt reactor and electrolytic process which separates magnesium metal from chlorine.

Byproducts of this industrial process include VOCs and NO_x, as well as chlorine which is converted into hydrochloric acid. All of these byproducts contribute to ozone and secondary particulate matter formation in the NWF NAA. In 2021, US Magnesium's permitted potential to emit was up to 894 tons per year (tpy) of VOCs, 1,261 tpy of NO_x and 8,522 tpy of Hazardous Air Pollutants (HAPs). These emissions make US Magnesium's Rowley plant one of the largest point sources of VOCs and NO_x in the greater Wasatch Front and the largest point source of HAPs in Utah. US Magnesium is also a unique source of halogen emissions which have been shown to impact both summer and wintertime pollution (APPENDIX B and APPENDIX C).

Additional Scientific Justification

Beyond the fact that emission sources within the proposed new boundary are located in the same geographic extent, airshed, and are wholly located inside a county that currently has portions designated as nonattainment, several studies have examined how emissions from US Magnesium impact air quality along the Wasatch Front.⁹ These studies looked at the impacts of emissions from US Magnesium on the formation of both wintertime PM_{2.5} and summertime ozone. These studies found that emissions from US Magnesium extend to nearly the entire Wasatch Front with plumes emitted from the plant observed across a wide sector of the populated regions of the valleys, and that secondary chemistry from these plumes result in a 10 - 20% increase in PM_{2.5} in the urban regions of the valleys as well an increase of up to 10% in ozone formation due to the production of additional oxidants (Appendix B). Preliminary modeling by the UDAQ has also found increases in summertime ozone concentrations at a number of monitoring sites in the NAA downwind of US Magnesium due to halogens emissions (Appendix C). These results clearly show that uncontrolled emissions from within the proposed new boundary are regularly transported to the current NAA, and directly contribute to the area's air quality challenges.

Regulatory Requirements CAA Section 182(b)(1)(A)

Section 182(b)(1)(A) of the CAA¹⁰ requires areas classified as moderate nonattainment to reduce VOC emissions by 15% over a baseline period as part of the State Implementation Plan (SIP). This requirement is known as Reasonable Further Progress (RFP). Given Utah's previously successful implementation of VOC emission reduction strategies as part of the state's efforts to reduce PM_{2.5} pollution, reductions that count towards RFP have become exceptionally challenging to identify. The expansion of the nonattainment boundary as requested would enable the state to implement VOC reduction strategies that would reduce Utah's summertime ozone while helping to meet Utah's RFP requirements as required under Section 182(b)(1)(A). Beyond RFP requirements, any sources included in the new proposed boundary would be subject to the CAA Section 182(b)(5) offsetting requirements, requiring

⁹ Carrie Womack, Wyndom Chace, Siyuan Wang, Munkh Baasandorj, Dorothy Fibiger, Lexie Goldberger, Ben Lee, Colin Harkins, Duseong Jo, John Lin, Brian McDonald, Erin McDuffie, Ale Franchin, Ann Middlebrook, Alexander Moravek, Jennifer Murphy, J. Andrew Neuman, Joel Thornton, Patrick Veres, Steve Brown; Mid-latitude ozone depletion and air quality impacts from industrial halogen emissions: aircraft measurements in the Great Salt Lake Basin (2022); Chace, W., Womack, C., Fibiger, D. L., Lee, B. H., Goldberger, L., Thornton, J. A., Brown, S.; Evaluation of Halogen-Induced Ozone Depletions Near Salt Lake City. American Geophysical Union, Fall Meeting 2020, abstract #A150-0010.

¹⁰ Codified at 42 U.S.C. § 7511a(b)(1)(A).

certain sources requesting modification to permits to offset or bank emissions, and further contributing to the area's ability to meet the CAA requirements and attain the standard.

Conclusions

As Utah strives to meet the current NAAQS and its regulatory obligations under the CAA, it is imperative that the state is able to control and reduce emissions from every source that impacts air quality while adequately accounting for those emission reductions. US Magnesium is located in the same geographic region, is within the same interconnected air shed, is located within a county that is part of the current boundary, and has been shown to have a significant impact on both wintertime PM_{2.5} and summertime ozone in the NWF NAA. The expansion of the boundary as requested would give the state the tools necessary to implement VOC reduction strategies that would reduce Utah's summertime ozone while helping to meet Utah's RFP requirements under Section 182(b)(1)(A) of the CAA. The State of Utah requests that EPA adjust the current boundary of the NWF NAA to include the southwestern edge of the Great Salt Lake in Tooele County. Given the pending statutory deadlines of the current round of state implementation planning for the 2015 ozone standard, Utah also requests that EPA act on this request as expeditiously as possible.

APPENDIX A: HYSPLIT forward trajectories indicating the presence of emissions from US Magnesium along the Wasatch Front on multiple different days in 2017.

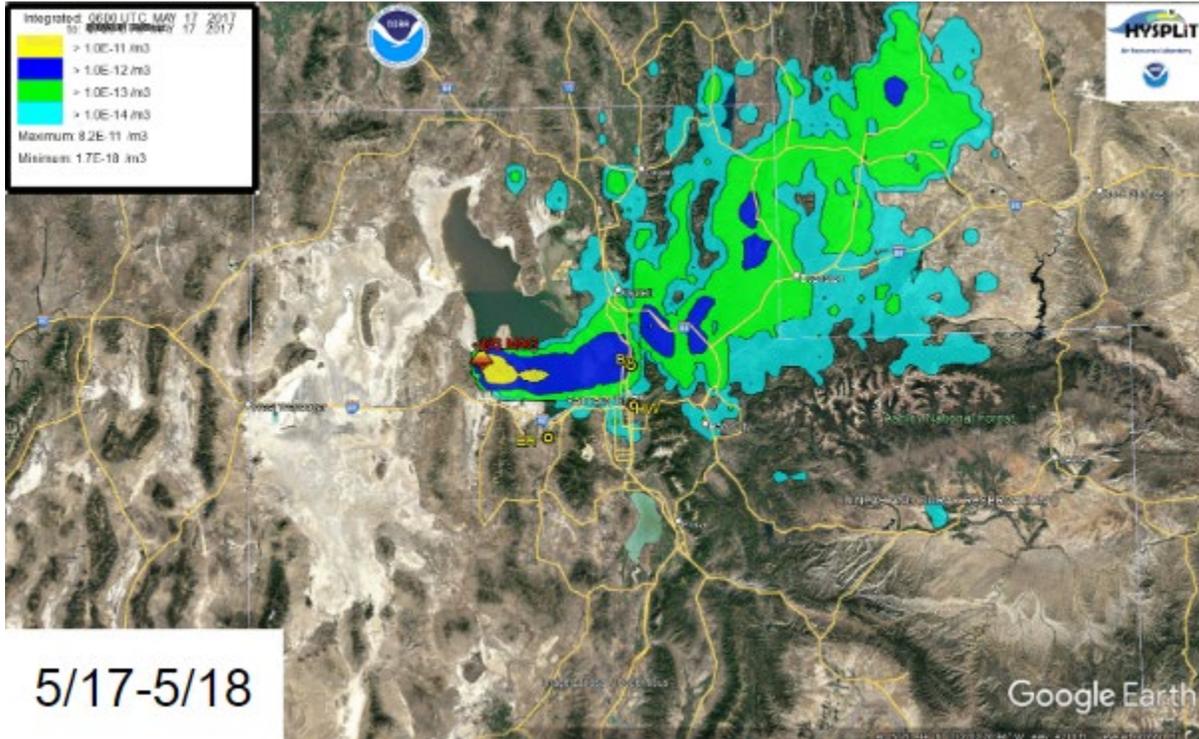


Figure 3: HYSPLIT forward trajectory from 5/17/2017

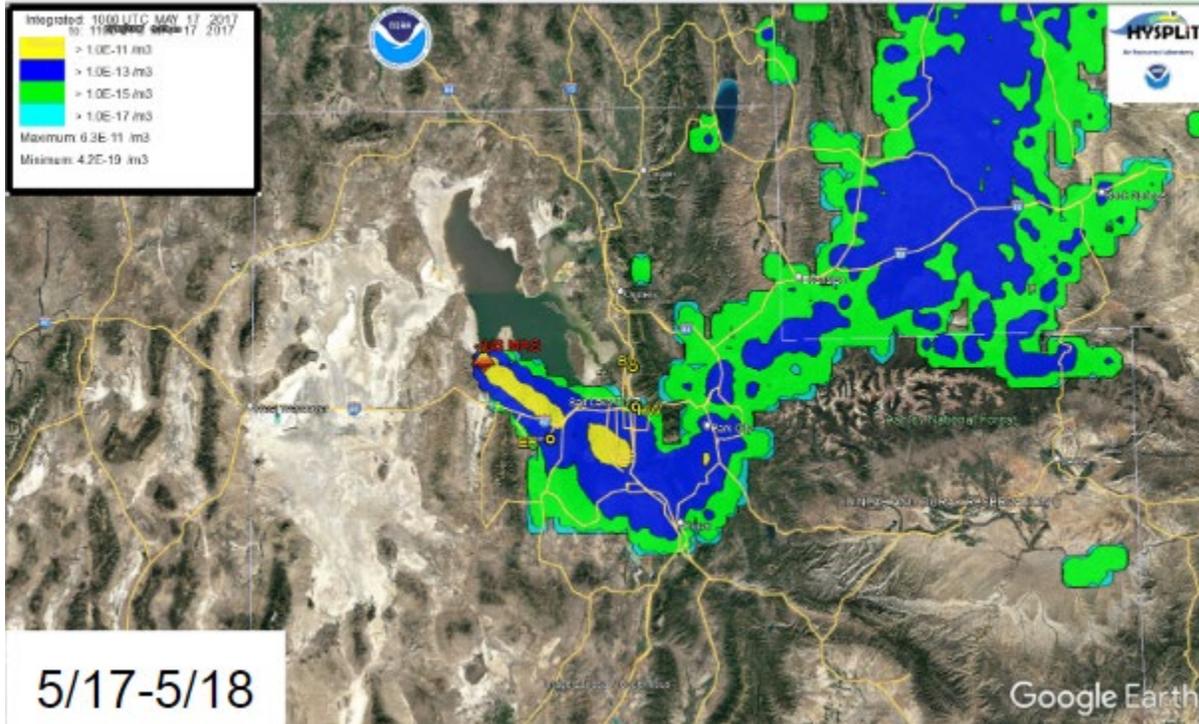


Figure 4: HYSPLIT forward trajectory from 5/17/2017

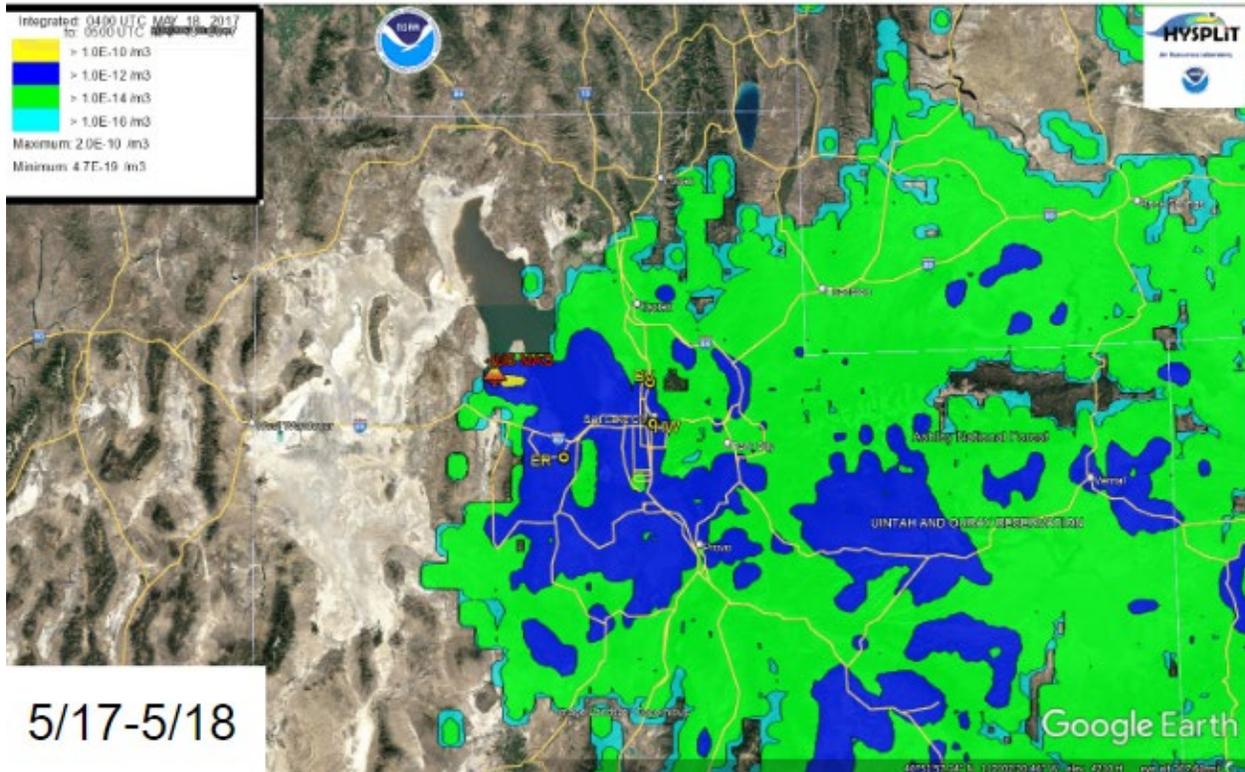


Figure 5: HYSPLIT forward trajectory from 5/18/2017

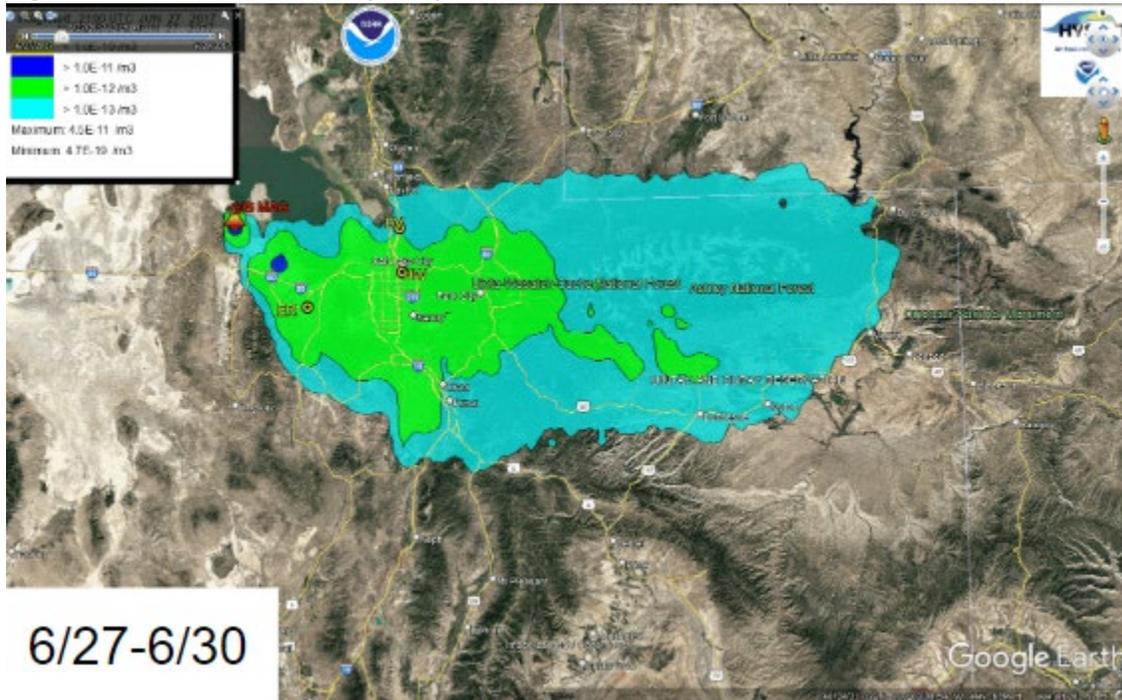


Figure 6: HYSPLIT forward trajectory from 6/27/2017

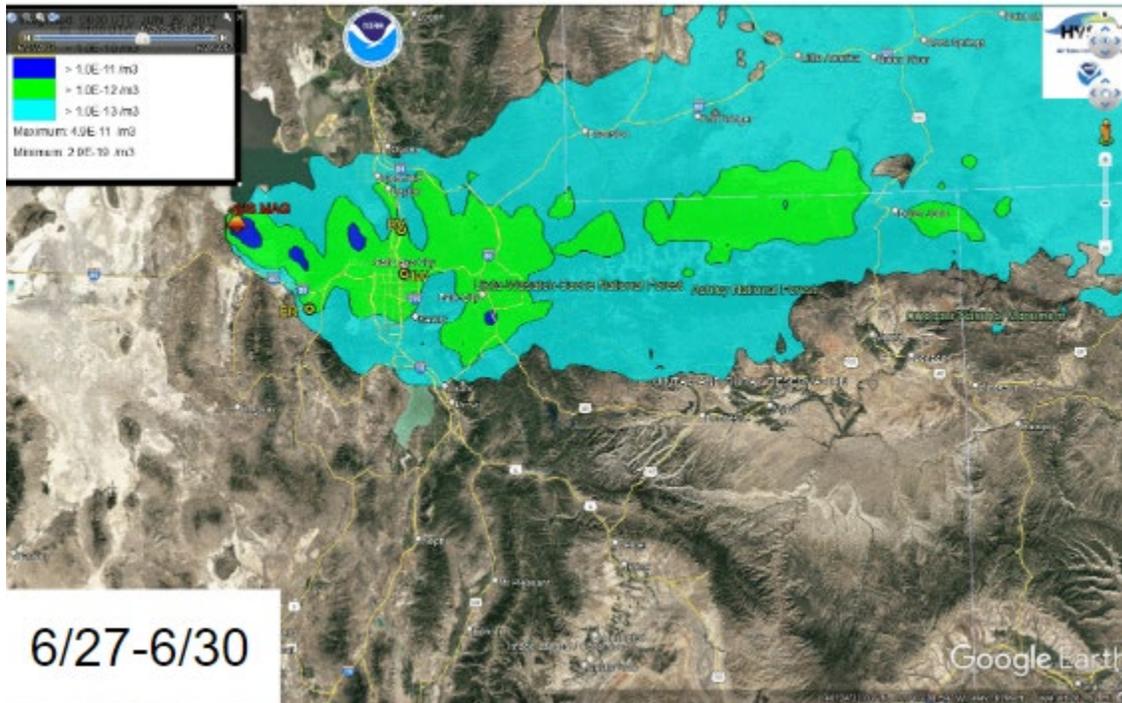


Figure 7: Figure 6: HYSPLIT forward trajectory from 6/28/2017

APPENDIX C: Cb6r5h Results

To examine the impact of emissions of Cl_2 , HCl , Br_2 and BrCl , from US Magnesium on ozone formation in the Salt Lake Valley, modeling was conducted with and without the inclusion of halogens emissions from the plant. The Comprehensive Air Quality Model with Extensions (CAMx) was run using Cb6r5h. Cb6r5h is a chemical modeling mechanism which includes halogens chemistry that was recently developed by Ramboll using funding from UDAQ. Findings showed increases in the Mean Daily 8-hour Average (MDA8) of ozone concentrations of up to 1.6 ppb downwind from US Magnesium, on a typical ozone exceedance day, with greater increases in the northern part of the valley. The observed spatial distribution is consistent with HYSPLIT dispersion analysis and the concentration of large NO_x and VOC sources in that area (Figure 8). Relative to the 2015 8-hr ozone NAAQS of 70 ppb, the observed increase of 1.6 ppb is not insignificant and it is likely this estimate is on the lower end of actual impacts (i.e. may be underestimated). Iodine compounds, such as I_2 , ICl and IBr , were not included in this analysis, all of which can contribute to ozone formation. No measurements of these iodine species from US Magnesium have been conducted to date. However, it is highly plausible that these species are emitted by US Magnesium as byproducts, similarly to how BrCl and Br_2 are emitted, and thus could lead to even greater increases of oxidant production and ozone formation. Ramboll is currently in the process of further updating the cb6r5h chemical mechanism by adding additional reactions between NO_2 and halogens, which should further help refine these modeling results. These results demonstrate the impact of US Magnesium emissions on ozone formation, with halogens emissions being associated with increases in ozone concentrations across the greater NWF NAA.

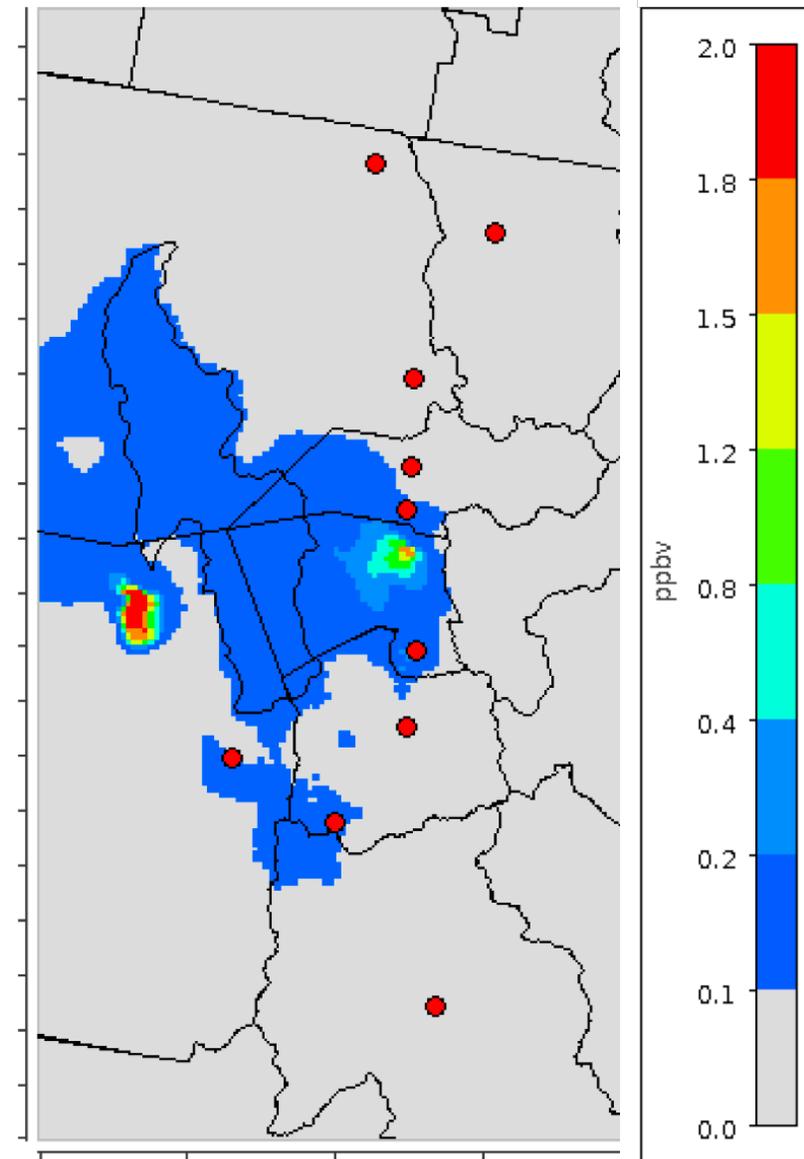


Figure 8. Difference in maximum daily 8-hour average concentration between simulation runs with and without halogens emissions from US Magnesium on a typical ozone exceedance day. Color scale saturates at 2 ppbv to make the distribution visible over the entire domain. Positive values indicate an increase in ozone formation when halogens emissions from US Magnesium are included. Red dots correspond to DAQ monitoring stations.