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Please see attached regarding topography, elevations, wind, climate and stack height.

Air Quality Permit Considerations for Aluminum Dynamics Plant in Benson, Arizona

Overview

This document addresses the air quality permit application for the proposed Aluminum Dynamics recycling plant in Benson, Arizona. The focus is on the unique topography of the region and its implications for stack heights and air pollutant dispersion.

Site Elevation and Topography

- The proposed plant site sits at an elevation of 3,566.69 feet.

Eastbound Elevation Changes Along I-10 (toward Dragoon Road)

- 1 mile east: 3,570.61 ft (near Pomerene Exit)
- 2 miles east: 3,641.98 ft (+75.29 ft above site)
- 3 miles east: 3,731.30 ft (+164.61 ft)
- 4 miles east: 3,827.40 ft (+260.71 ft)
- 5 miles east: 4,053.84 ft (+487.15 ft)
- 6 miles east: 4,208.78 ft (+642.09 ft)
- 7 miles east: 4,312.52 ft (+745.83 ft)
- 12.5 miles east: 4,754.14 ft (+1,187.45 ft)

The Dragoon Mountain Range, immediately east of Benson, reaches up to 7,520 feet at Mt. Glenn and spans approximately 25 miles north to south, running parallel to both Benson and the San Pedro River. This range further restricts the dispersal of stack emissions.

Westbound Elevation Changes Along I-10 (toward Skyline Road)

- 1 mile west: 3,643.50 ft (+76.81 ft above site)
- 2 miles west: 3,812.51 ft (+245.82 ft)
- 4 miles west: 4,078.95 ft (+512.26 ft)
- 5 miles west: 4,203.50 ft (+636.81 ft)

Key Benson Locations and Their Elevations

- First Baptist Church of Benson: 3,859.69 ft (+293 ft above site), 1.4 miles southwest
- Benson Unified School District: 3,656.45 ft, 0.6 miles from site
- Benson Hospital: 3,665.16 ft (+98.47 ft above site), 1.14 miles away

Regulatory and Environmental Considerations

The EPA often treats terrain features like valley walls as obstacles for Good Engineering Practice (GEP) stack height calculations if they are taller than the stack and located nearby.

- The proposed stack would be situated below valley walls rising 600 to 1,200 feet, within a narrow valley characterized by rapid elevation gain just a few miles away.
- Such terrain significantly influences how pollutants disperse, especially in a single river drainage system like Benson's.

Impact of Local Climate and Terrain on Pollutant Dispersion

The region's arid climate, together with seasonal monsoon flooding, can concentrate pollutant levels within the valley. Such environmental conditions may amplify emission effects due to limited dispersion and periodic accumulation during flood events. Prolonged cold weather in winter and cool nights throughout the year further exacerbate the 'lid effect', restricting vertical air movement.

Key Terrain and Meteorological Effects

- Flow Channeling and Stagnation: Valley walls channel wind flow, reducing lateral dispersion and causing air stagnation at the valley bottom. This traps emissions near the source and increases local pollutant concentrations.
- Thermally Driven Local Circulations: Mountain and valley breezes, driven by daily heating and cooling, can recirculate pollutants within the valley, promoting accumulation during stable conditions.
- Temperature Inversions: Frequent nighttime and winter temperature inversions create a "lid" over the valley, suppressing vertical air mixing and trapping pollutants close to the valley floor.
- Recirculation Zones: The complex terrain can generate zones of recirculating or stagnant airflow, leading to localized areas of higher pollutant accumulation.

- Reduced Vertical Mixing and Ventilation: Stability, terrain blockage, and limited cross-valley winds diminish mixing and dispersal, resulting in prolonged pollution events.
- Impact of Synoptic Winds: Large-scale wind patterns may either improve ventilation or worsen stagnation, depending on their direction and strength relative to the valley's orientation.

Questions on Stack Height and Dispersion Modeling

Given the topographical challenges:

- Is it reasonable to approve stack heights of 100 feet or less when elevations just a few miles away exceed the site's elevation by several hundred feet?
- Was a site-specific air dispersion model conducted to fully assess particulate impact on residents, the riparian zone, and the San Pedro River?

Without a comprehensive understanding of these factors, approving the permit may present significant liability concerns.

Thank you for your consideration