Educational Series: Aircraft Noise Modeling

September 2023

Noise Modeling

- Understanding how noise models work
- Model inputs
- Model outputs

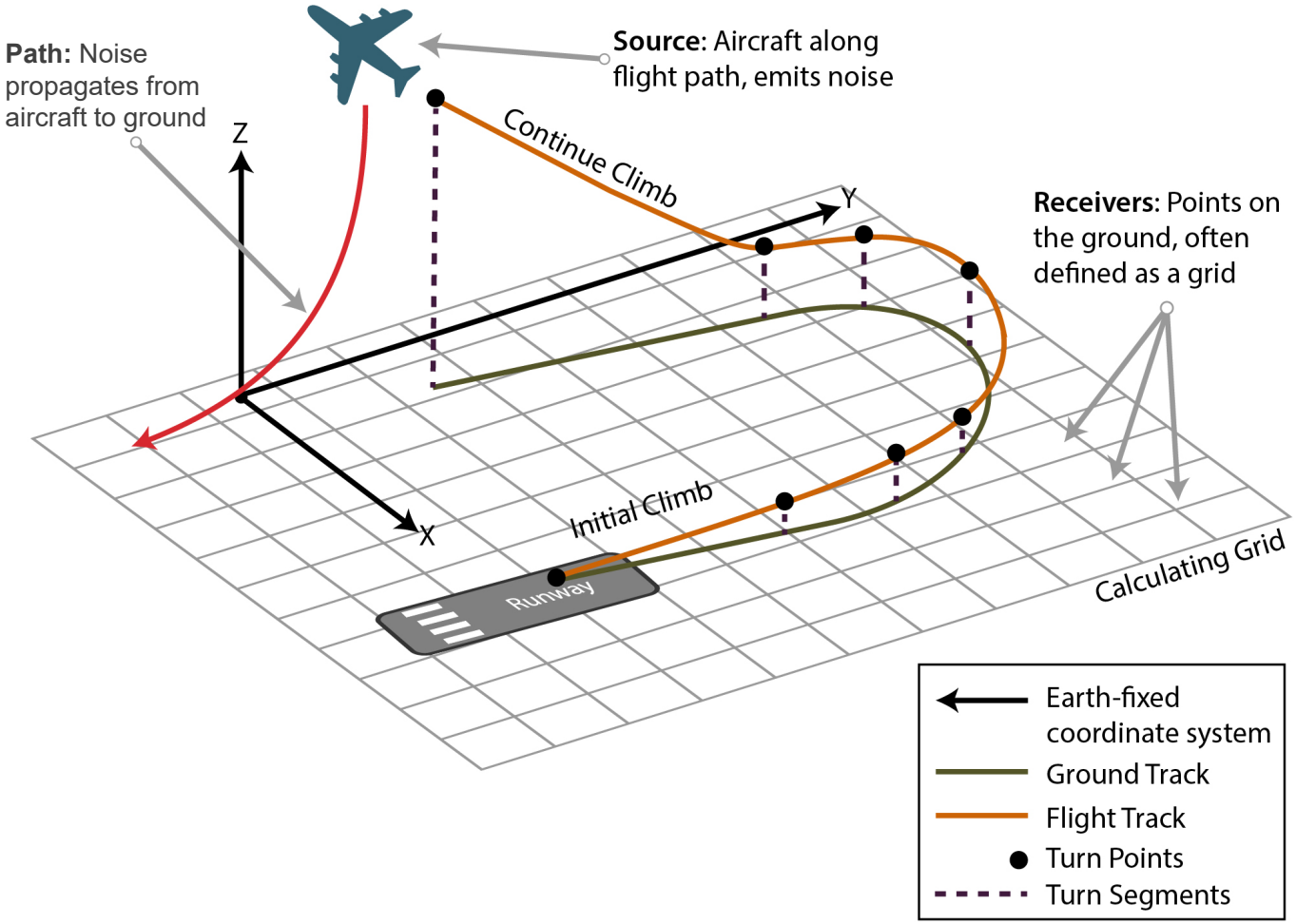
Why do we model noise?

- Measurements are typically “snapshots” of existing environment
- Not feasible/reasonable to measure at the spatial resolution and area coverage achieved by modeling
- Impossible to measure future noise
- Need consistent comparison of scenarios: modeling is extremely accurate for making comparisons of one scenario to another

FAA Required Noise Model – Aviation Environmental Design Tool (AEDT)

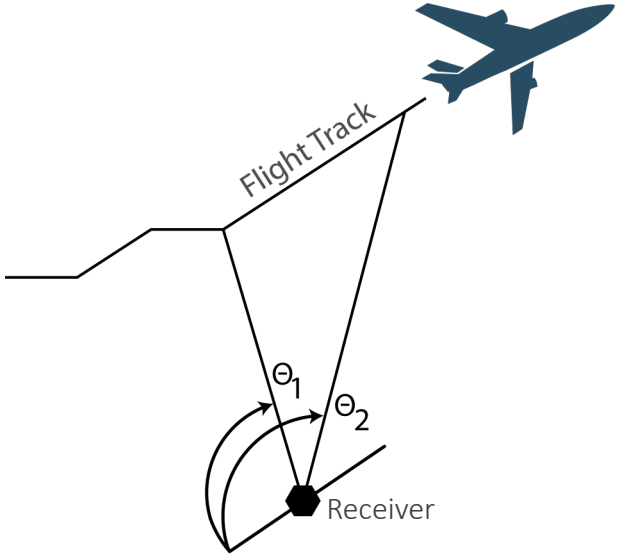
Three Primary Areas

How do noise models work?



Receivers: Calculating Noise at Points on the Ground

- Integrating-type noise models break a flight down into digestible segments
- For each receiver, the model looks up the Sound Exposure Level (SEL), using power setting and distance for each flight segment from the Noise-Power-Distance (NPD) curves
  - Based on noise measurements provided by the manufacturer as part of flight certification process
- AEDT calculates noise fraction for each segment, multiplies by energy from the above step, then sums segments



Noise Fraction Concept

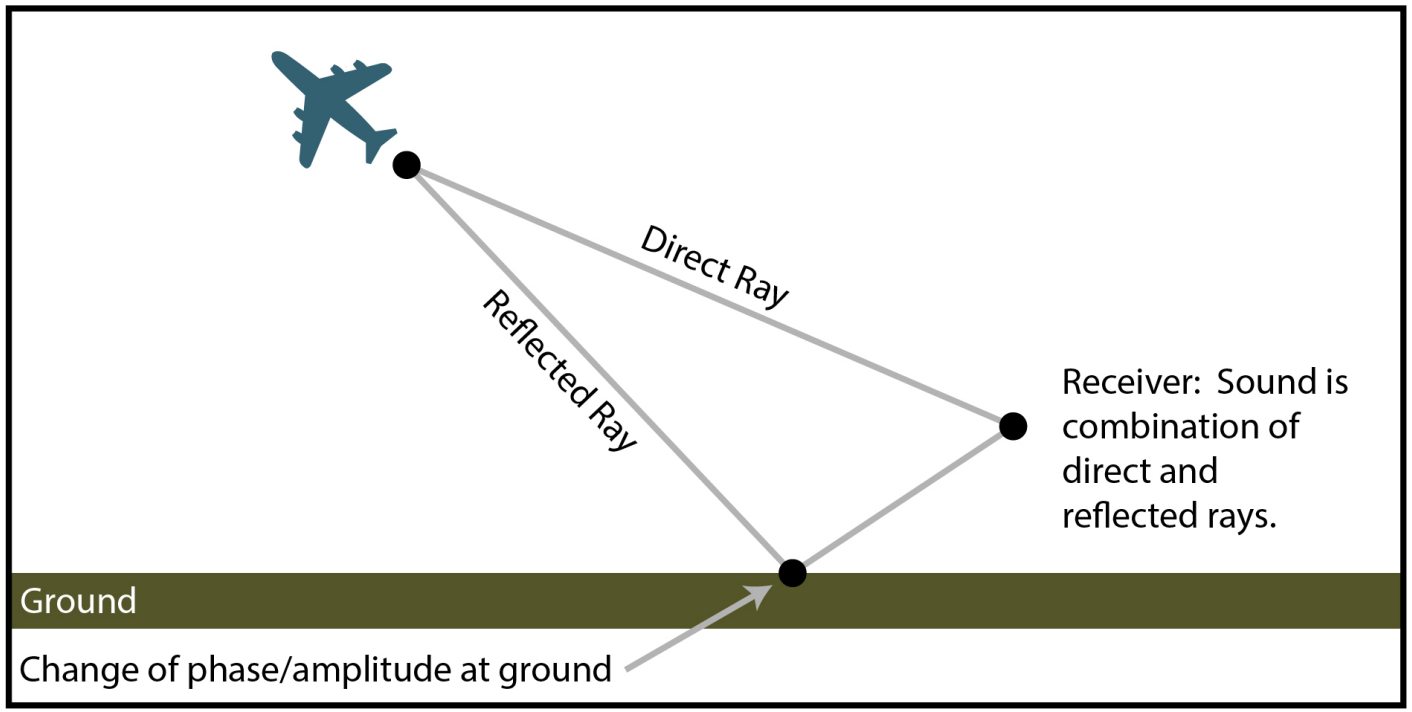
Paths: Fixed and Variable Propagation Effects

Fixed

- Spreading: 6 dB decrease per doubling of distance
- Air absorption
- Ground effect

Variable

- Refraction by wind and temperature gradients
- Turbulence
- Terrain (variable in position – hopefully not in time)

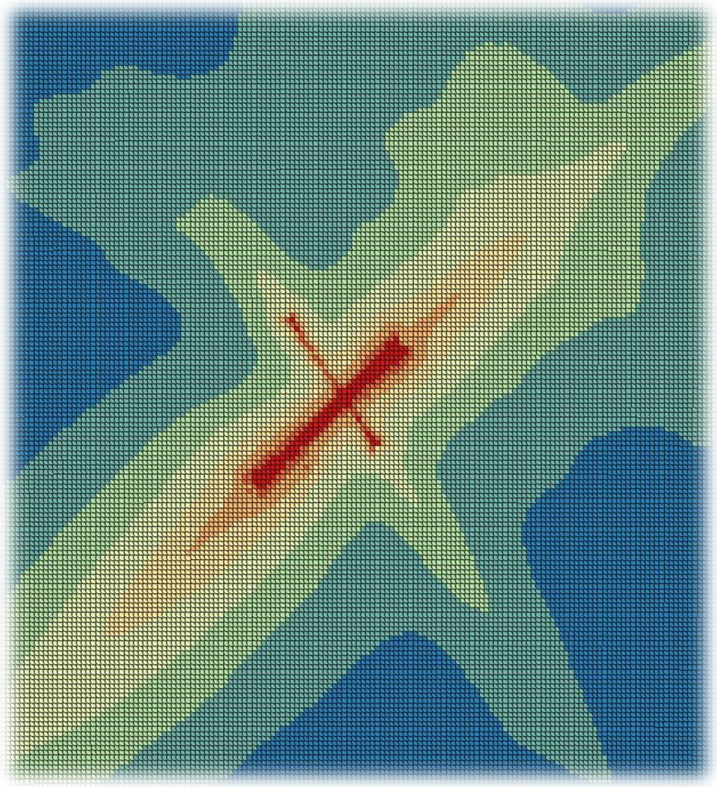


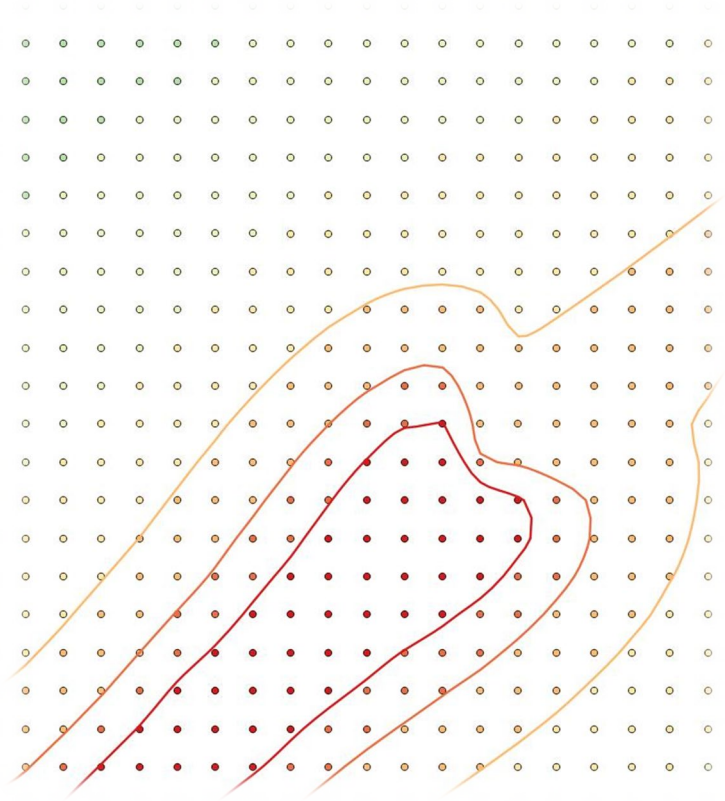
Typical AEDT Inputs and Data Sources

AEDT Input Category	Typical Data Source
Airport Layout	FAA 5010 data and airport
Aircraft noise and performance	Standard AEDT database
Aircraft operations	FAA ATADS, airport forecasts, FAA TAF, airport NOMS
Aircraft runup operations	Airport staff/logs
Runway use rates	Airport NOMS, FAA NOP, ATCT personnel, airport staff
Flight track geometry and use rates	Airport NOMS, FAA NOP, ATCT personnel, observations
Meteorological conditions	Standard AEDT database
Terrain data	USGS National Map Viewer

ATADS = Air Traffic Activity System
TAF = Terminal Area Forecast
NOMS = Noise and Operations Monitoring System
NOP = National Offload Program
ATCT = Air Traffic Control Tower
USGS = US Geological Survey

AEDT Output



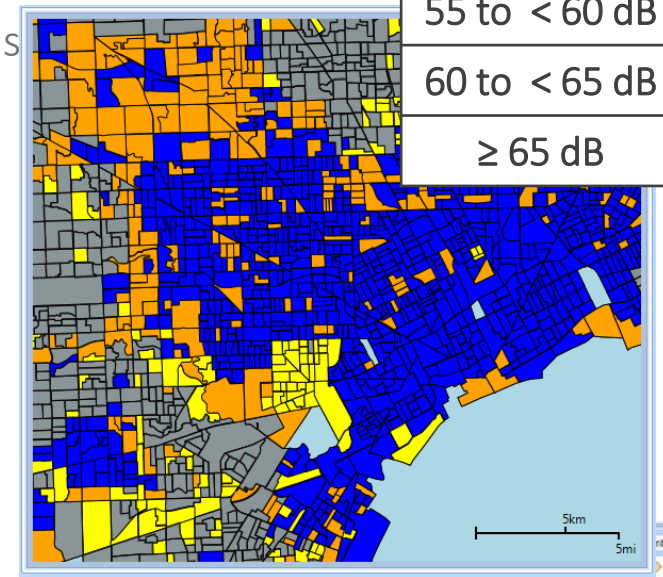


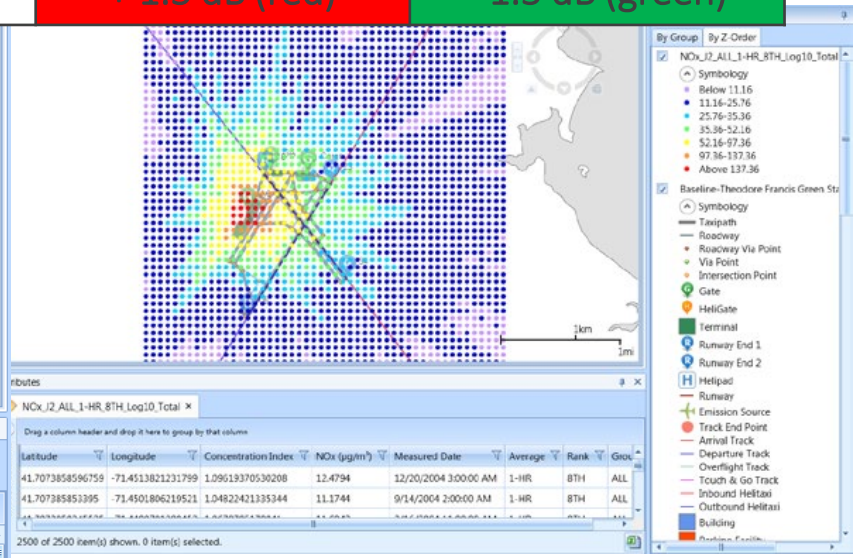
- Contours
  - DNL/CNEL
  - Single Event (SEL, Lmax)
- Noise levels at specific points
  - Detailed reports of noise contributors
- Population impacts
  - Requires population receptors

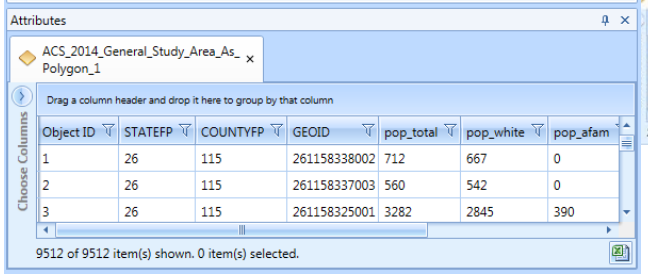
AEDT Output/capabilities

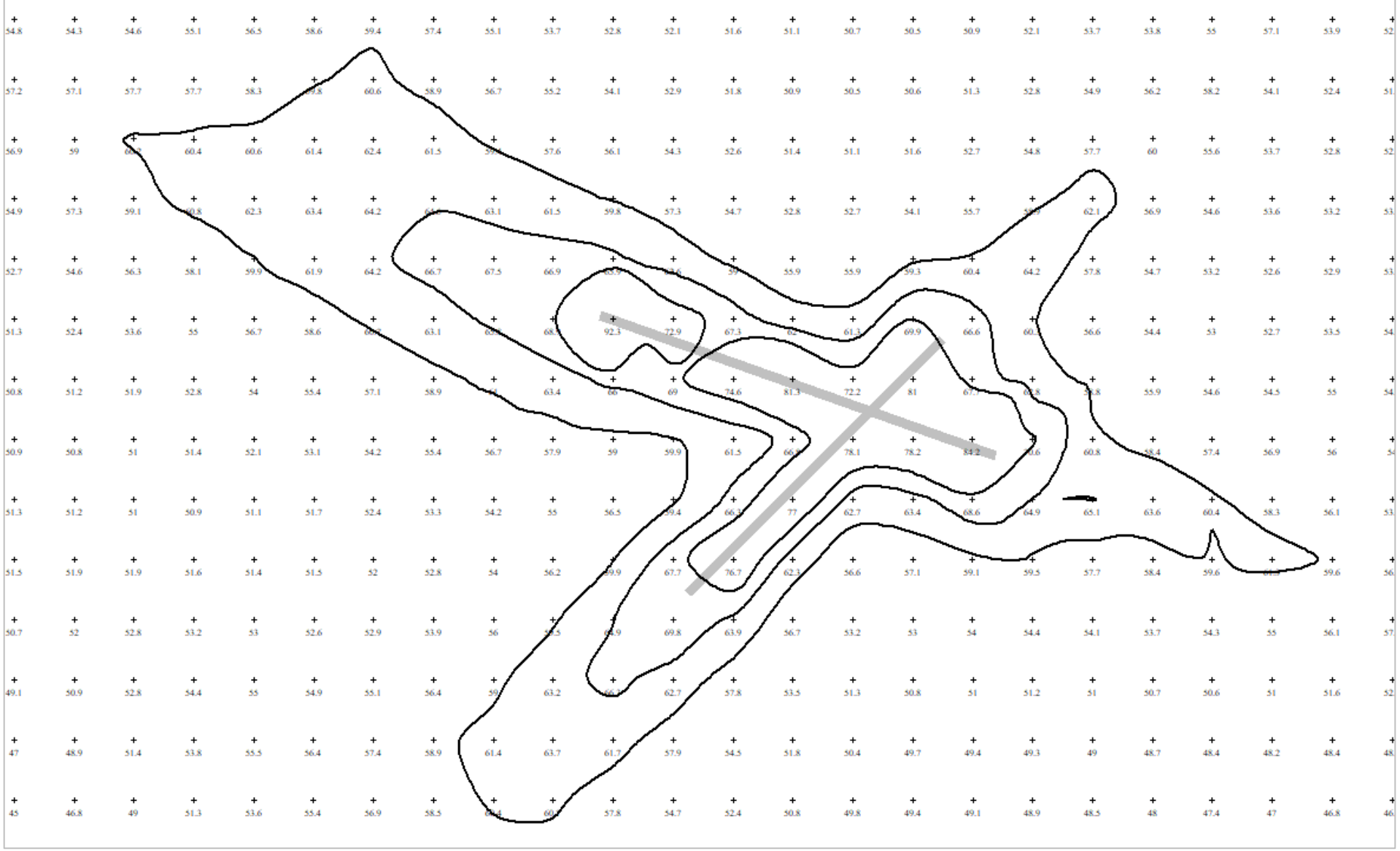
- NEPA significance criteria
- Environmental Justice (EJ) analysis
  - Focus on low income, minority, and limited English proficiency populations
  - At Census block group level
- Fuel burn
- Air Quality
  - Emissions inventory
  - Dispersion modeling

"Proposed" DNL	Change in Noise Level from No Action Alternative to Proposed Action	
	Increase	Decrease
< 45 dB	No Color	No Color
45 to < 50 dB	+ 5 dB (yellow)	- 5 dB (magenta)
50 to < 55 dB		
55 to < 60 dB		
60 to < 65 dB	+ 3 dB (orange)	- 3 dB (blue)
≥ 65 dB	+ 1.5 dB (red)	- 1.5 dB (green)



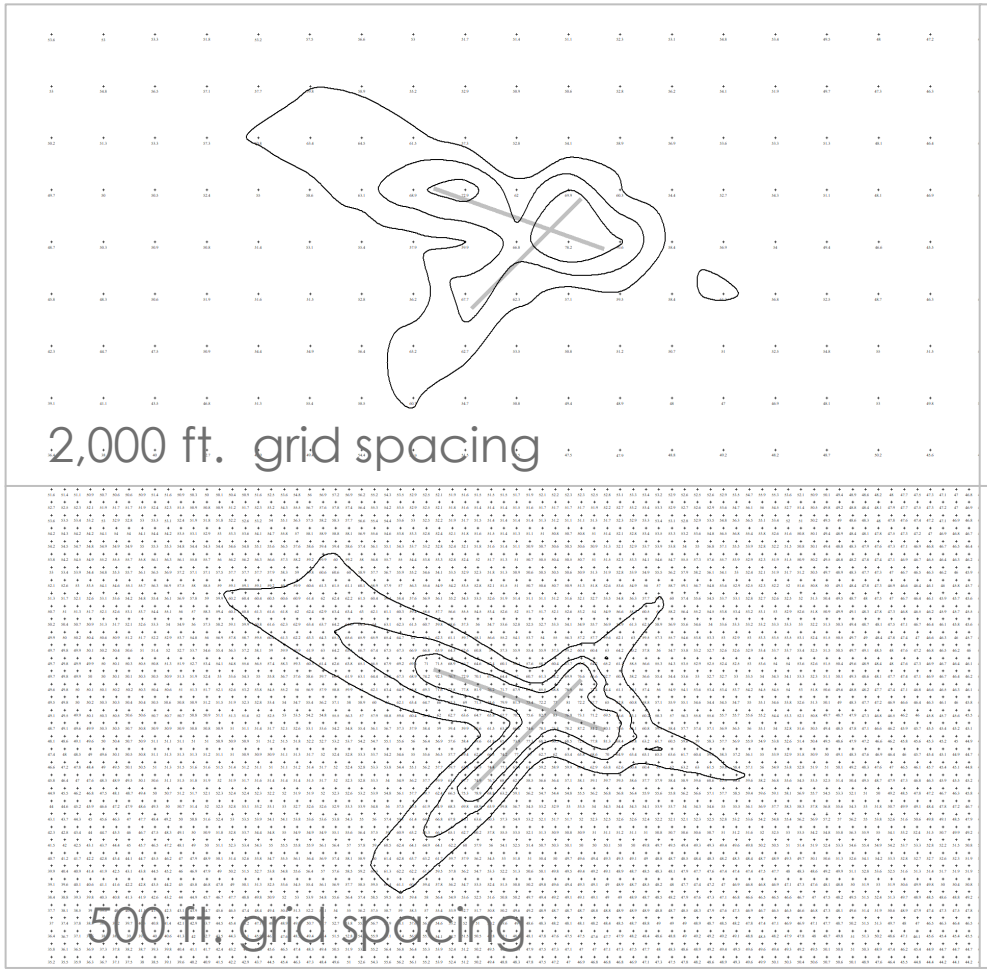






Noise Contours are Lines of Equal Noise Exposure

Grid Spacing Can Affect Contours



Questions/Discussion

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