FNSB Model Update Process and Status

Phase 1   Update Existing Model to new software version of CMAQ; Build/Update new environment

- Update software version to assess the changes; software version 4.7.1 to 5.3.2 – using all the same data in both
    - o   Understand how new software version affects organic matter (largest component of PM2.5)
    - o   Understand how the preprocessor models work (several small models had to be updated as well)
    - o   Compare major species of organic matter, sulfate and PM between the two model versions. Identify the major changes in chemistry and profiles in the new version of CMAQ, so we know what to expect when building the new meteorology and emission inventories.
- Build the framework that hosts the model
    - o   Build 16 processor Linux server capable of averaging 8 days per model run (approx. 35 days of data)
    - o   Build process to download the CMAQ code from the EPA website and compile the model for the specific Linux system
    - o   Build two identical systems (down to several decimals of accuracy) one at DEC, one at contractor for speed and efficiency since every model run is 8-14 days (depending on the processing speed and what is being run) and redundancy for contingency.
- Limitations
    - o   Using OLD meteorology (2008) and emissions (2019)
    - o   Meteorology and speciation data (PM on filters) from Fairbanks, NONE from North Pole
    - o   No new speciation data that is needed to assess model performance
- Status: Phase 1 is complete, and the final report is being reviewed at EPA/DEC for the next month (Aug 2021).

Phase 2   Develop Modeling Platform using latest CMAQ software version (5.3.2) using NEW data

- Evaluate the new model
    - o   Model runs focusing on diagnostic tools and model performance (est. 2-3 months)
    - o   Compare raw CMAQ model output values to actual monitored values from NCORE and Hurst Road grid cells.
    - o   Model Performance: compare raw CMAQ model outputs to speciation sampler data for PM2.5, sulfate, nitrate, PM other, ammonium
        - ▪   Speciation samplers are run on 1 in 3 day schedule so for 88 days, we will have speciation for approximately 30 days for model performance at Hurst Road and NCORE.
        - ▪   Model performance must be approved by EPA (soccer plots for every species at both monitors are required as well other metrics per EPA guidance)
- Finalize new episodes and WRF model
    - o   New 88 day episode vs two two-week episodes (2008)
    - o   New WRF – based on new meteorology from Hurst Road (previous WRF from 2008 used Fairbanks)
- Status: Phase 2 is starting, WRF expected to be completed in Sept/Oct. Point source hourly data was collected. Anticipate model evaluation in March with EPA approval by spring.

Phase 3   PM2.5 Model for regulatory purposes
- Prepare model for use
    - o   New 5-yr modeling design value; new base year, new emission inventory
    - o   Update Sandwich and SMAT models that must be used for regulatory purposes
    - o   Develop new emission inventories for future years
    - o   Conduct future year model runs to assess controls (2-5 model runs)
    - o   Run updated SMAT (speciated modeled attainment test per EPA guidance) to get the new attainment year by calculating a future modeling design value
    - o   Updated precursor runs for NOx, SO2, NH4 and VOCs must all be run (zero out runs, 4 model runs)
- Status: Started identifying elements to update in emission inventory (ex. Home heating survey).