Santa Fe – IMPROVE Steering Committee Meeting 11/1/2016

8:00 opening remarks – Scott Copeland, Josh Hall

NETWORK REVIEW

Optical, Scene Monitoring: Mark Tigges (Air Resource Specialists)

- National Capital was removed in April 2016
- 4 self-service nephelometer sites in operation
- 7 full service nephelometer sites in operation
- Acadia will receive a new shelter and camera upgrade
- Arizona DEQ donated 14 nephelometers, 17 23x Campbell dataloggers to the program
  - no datalogger enclosures, no auto-span systems
- Upgraded/Modified loggers use less power, hold more data
  - only 1 upgrade complete this year (GRSM)
- 21 Web cameras in 19 parks
  - 74-76% of NPS web traffic goes to cameras
- New website and web will launch in Spring 2017
  - interface will be more mobile friendly
- Archive of images and associated data will be available for the full history of each site

Questions/Comments:

Copeland: What were the data completeness statistics for nephelometer data
Tigges: 90% this year
Prenni: Night Sky camera archive images should be available with 2017 enhancements

Quality Assurance – Field Audits: Derek Day - CIRA

- QAPP Revision – more detailed QA work needed
- Derek to visit each site every 10 years
- During non-travel season Derek will help with data audits and other needs
- Completed audits are useful to identify issues at sites
  - Weminuche example, support structure degrading, stacks not all the way in, tree obstruction
  - Working with site operator to remedy
  - Boulder Lake, WY issue – found leak due to incorrect plug in hole for temp sensor
- During each audit flow rate verified using 2 DeltaCals
- Audit cooperation from different agencies
  - ADEQ, CDPHE, EPA R1, EPA R4, CSU = 36 sites/year
- Goal is to audit all sites within 10 years

When flow rates in question – lab will use backup flow, or nominal flow – there are sites with known issues that are resolved when feasible. Some operators can/cannot perform fix

Questions/Comments:

Hyslop: Will auditor certification/training be required?
Need audit equipment consistency as well

Nicole Hyslop: Aerosol monitoring update

- Chuck McDade retired in June
- New field manager hired this year (Yongjng Zhao)
- Additional help was needed with the addition of CSN network
- No new sites installed this year, no sites shut down
- 2 new sites are planned – Wisconsin (tribal), Carlsbad Caverns

- Data submittal – preliminary data delivered through March 2016
- Data delivery – 7-10 months after samples received
- XRF data analysis completed quickly
- Sample losses – tracked by year and reason
- RHR completeness criteria - # of sites per year (fewer than in past years)
- Point Reyes – mouse infestation
- Sampler maintenance interval changed from annually to every 2 year
    - Not yet sure what effects this is having on data
    - Potential risks of extended maintenance intervals
    - Site visits taking twice as long
    - Seeing buildup of particulates/dirt/dust, more maintenance needed
- UC-Davis improved flow rate calibration bias compared to EPA audits.
    - Is flow rate drifting more and not being seen due to 2-year intervals vs. flow calibration change? Hard question to answer.
- Safety issues identified
    - Asking owners to provide safe access/protect from fall hazards/electrical hazards/etc
- Looking for input from group on how to fund/remedy
    - *NPS sites – fixed 2 sites due to safety issues covered by overhead funds (Prenni)*
    - *Sponsoring agency is responsible for site infrastructure (Scott)*
    - *BLIS is bad and needs to be fixed*
    - *UCD should contact local site contacts and sponsoring agency*
    - *Who has power to get local action?*
    - *? Recommendation from committee on how to best accomplish*
    - *Can only ask agencies to help – cannot compel*
    - *Funding is often not the hang-up. Paperwork, contracting, etc – Process cannot be circumvented*
    - *Safety issues should be highest priority (Vimont)*
    - *Issues need to be communicated –*
    - *Sites can be shut down if necessary (Copeland)*
    - *List of problem sites needs to be put together (Gordon) – list started, not completed yet*
        - *Starting with site photos to identify issues, also site visits*
    - *Safety issues brought to forefront with new personnel (Nicole)*
    - *All field engineers required to take electrical safety and climbing courses*
    - *Add checklist to Derek's audit list*
    - *UCDavis will share list of problem sites with group*
    - *(Vimont) ask to send checklist to operators as first line of investigation*
- Redesigned LINUX controllers have been operated and tested at UCD for last 4 months
- Will be cheaper to deploy replacements. A card can be sent instead of whole unit
- Will new controllers be more susceptible to electrical issues?
    - All sites need to be properly grounded before new controllers are rolled out across network
    - *Have these been tested in cold environments (Vimont)*
    - *Nicole: freezer purchased for testing*
    - *May need heater coil or other add-ons*
- Test deployment will occur at Phoenix collocated site and 2 CA sites for ease of access
- If goes well – roll out Spring 2017
- New instructional videos for training – You Tube link available from UCD website
- Data Management Transition – old software no longer supported
- New database system – SQL database with .NET applications
- New validation tools using R software/freeware
- One page annual summaries prepared for each site – delivered to operators during maintenance visits

        - 2nd page added this year with additional map – based on feedback
    - Working on 2017 IMPROVE calendar – pass along pictures if you have them
    - OC/EC measurements – CSN data compare well with IMPROVE data
    - Seeing decrease in Nickel/Vanadium related to emission control regulations for bunker fuel

Questions:

Moore: Who initiated Carlsbad site?

Prenni: NPS – waiting for power to be installed. Wanted due to proximity to O&G development

BREAK

Tracy Dombek: Ion Analysis

- New contract
- Data are reported within 60 days
- Changes have been made for data review process. No longer manual review
- Access database utilized to see results sooner, easier QA review as well
- Data are currently meeting DQOs outlined in QAPP
- Performing routine filter re-extraction for additional QA/QC checks
- Nitrite results not as good – filter contamination likely culprit (gloves)
- Reanalysis of samples – good for nitrate/sulfate, not for chloride/nitrite
- Reanalysis different from duplicate
    - duplicate = back to back
    - reanalysis = days later with different standards, personnel, etc
- Chloride an issue – compared lab and field blanks
- Started using method blanks in 2016
- Analysis used to determine MDL to base DQOs with more variability in conditions to obtain better detection limits to better meet DQOs
    - *Verify detection limits? CSN uses method update rule, lab blanks, spikes, Lab will go back and verify*
    - *RTI – looking to improve MDL*
    - *Spike filter and send through the system. Method vs. instrument detection limit*
    - *Bret – asking for white paper proposal to come up with approach for implementation*
    - *Scott – changes would make for a more accurate MDL, no change in measurements*
    - *Field blanks always higher than lab blanks,*
    - *Bret – will this change IMPROVE equation? Use ½ MDL as sub?*
    - *Warren – IMPROVE MDL based on field blanks and used in equation, no effect on data*
    - *MDL detection from instrument*
    - *LDL – lower detectable limit*
    - ***(Terminology important)***
    - *Tracy – trying to better meet DQOs*

Judy Chow: Carbon Analysis

Update on multi-wavelength carbon analyzer refinement
Equipment transition - 7 in operation now, full 13 scheduled by end of year
Comparison b/w models good
Refinements being made for stable operation
Sample throughput will double with full instrumentation
Analysis of black/brown carbon and how they are measured by the new multi-wavelength instrumentation
Analysis for Phoenix would be good due to collocation (Moore)
Question for committee – do you want to see brown carbon in addition to black carbon included with data?
Different carbon in smolder fire vs. flaming fire
Info useful for characterizing optical properties of fires

Questions:

Tom: interesting to look at fire behavior during 24-hour period. Different emission rates for smolder vs. flame.
Judy: can only compare before/after due to 1-in-3 sample schedule
Warren: each wavelength has associated attenuation measurement and EC measurement
Judy – AAE = absorption angstrom exponent (based solely on optical measurement)
Brett – all 7 wavelengths delivered to UCD – can only be used in new database (available Jan/Feb 2017, AQS will be later as new parameter codes need to be created)

John Watson: Additional Characterization for IMPROVE/CSN samples

Direct measurement of OM/OC
Infer PM chemical nature and source
How can we get more information out of the collected samples
Additional markers can be obtained with filter remnants, non-destructive methods, etc
Not all samples, all the time, but can go back and look at the older data
Different types of PM (dust, biomass burning, diesel, etc)
AMS approach
High pressure argon to replace helium – inert gas replacement discussion coming
Fresno Supersite good site due to quartz filter history – lots of punches
How to get more out of solutions – many compounds showing up are secondary
Carbohydrates can help identify sources
Variety of analysis can be used to get more information from data in long-term networks
Challenges – making more efficient changes
Modify instrumentation
Maintain consistency – especially with advent of new technologies – need to be mindful of historic data
Develop more detailed source profiles, speciated inventories, source apportionment
Fuels and engines are much different now than they were 30 years ago due to reformulation and regulations – analysis needs to evolve

Questions:

Brett – can analysis be performed on archived filters?
Yes, but there are issue with the age of filters, storage, volatilization, etc

LUNCH

Tony Prenni: Budget & Network Status

- Updates: 2 new contracts for carbon and ion analysis
- 9 protocol sites shut down
- New sites expected in 2016/17
- Redesigned IMPROVE website
  - http://vista.cira.colostate.edu/Improve/
- QA support budget includes salary, travel, NIST standards
- 3 years from now could face shortfall again

UCD laboratory – TEMP/RH issue. All equipment currently being moved to another building – may help with issue. Partnership with university may be possible
Tom: IMPROVE reporting CIRA cooperative agreement for FED, quarterly reports
Program overhead: pays for contracting officer, website, site repair (major this year)

Tony Prenni: Website/WinHaze

- New website more mobile friendly, smart resize, removal of extraneous information
- Let Tony know if something is missing
- Please send photos from IMPROVE sites if you have them
- "News & Updates" has replaced "Bulletins"
- A listserv may be compiled. Let Tony know if you are interested in listserv updates
- Some tools available on FED also available on IMPROVE
- Website will hold conference materials
- Info on old/new equations, fRH file, ss_Rayleigh
- Haze Metrics Converter tool available on website
- WinHaze updates in progress. Work being done by CIRA and ARS
- WinHaze will be an online tool
  - Old program could be problematic if user did not have PC administrative rights
- Create new masking using GIS data
- Masking technique – map pixel by pixel distances

Scott Copeland: QAPP

- Dated March 2016, signed today (November 1, 2016)
- The goal is to have a "Living QAPP" and revise as necessary in interim years
- A major revision will be due in 5 years

Scott Copeland: Committee Business

- Scott to remain chairperson for another year (with Linda Geiser approval)
- 2017 Steering Committee meeting
  - proposed location in Northern Class I region, Ely/Boundary Waters or Voyageurs

Joann Rice: IMPROVE/CSN mega TSAs

- New QA personnel Jenia Tufts
- Link to full presentation from St. Louis in August
  - https://www.epa.gov/amtic/chemical-speciation-2016-naamc
- Lab audits – mega performance evaluation
- Annual PE audit samples

Keith Jones: Environment and Climate Change Canada: Monitoring Comparisons

Sites, networks, equipment (modified SuperSASS to use 2300 filters, 10 LPM)
Compare long-term data with IMPROVE
Is IMPROVE equation applicable to Canadian sites?
Differences in network – labs & equipment

IMPROVE used to use backup filter for OC artifact, now use field blank VOCs were likely contributing to OC artifact (Bret)
Methodology differences – different NH3 species
OM different rural vs. urban
K instead of Al for fine soil
Results – aerosol, bsp
Fine soil differences for Egbert confounding. Questions regarding equation, sequential/manual samplers (Joann). Going to go back to lab data for possible answers
Egbert speciation site shut down. No longer operates as inter-comparison site
Potential move to another site in Eastern Canada – more discussion coming

Questions:

Warren – speciation site at Yellow Knife, NWT (not long term according to Keith)
Tony: collocated met? Keith: yes
Joann: sampling configuration – old cartridges with Met One SuperSASS instead of using new cartridges with newer sampler. Keith believes it is to maintain continuity, but was not involved in discussion

John Vimont: RHR Metrics reporting

- Tracking Progress – currently using worst days
- Data not changing – just aggregated differently
- Impairment Approach – identify extreme "natural" events (wildfire and dust)
- Identify other natural contributions – modified NCII
- Divide sample into anthropogenic and natural
- Calculate impairment as anthro/total Bext
- Sort by impairment, then avg 20% most impaired
- Better captures meaning of CAA and identifies where controls are needed (can't control natural)
- Reduces impact from extreme events
- Has implicit estimate of "natural"
- Caveats: not all fire is natural, much dust is not
- Does not account for uncontrollable from other countries
- Consequences:
  - Sites dominated by organics will see more of a shift
  - Likely to see more days influenced by nitrate
  - Current SIPs based on haziest days. New rule will shift both baseline and glideslope and cause a disconnect with first round of plans

Scott – anthro-organic contribution in the east becomes zero. Needs to be addressed

Questions:

Warren: 60 second review of which OM/dust included in anthro
John: no dust
Bret: new NC with justification can be accepted by EPA

Tom Moore: tracking changes in visibility Class I areas

Maps of changes in visibility, non-attainment areas
RHR metric unchanged for the last 30 years
Changed in one year with no peer-review input
Impairment not experienced by visitor (visit on high fire day would be poor for visitor, but not addressed by RHR)
Most impaired days shift from summer (fire) to fall/winter (nitrate/sulfate)
Less regional transport
Modeled data – Bext contribution from anth sources

Scott: how can 20% most impaired be > 20W
Tom: modeled results shown on selected days (model performance issues, etc)
All SIPs (already submitted) must be revised/updated to reflect new rules
Language on IMPROVE website needs to be updated not to state source apportionment/emission source identification
Updated plans likely due summer 2021
Explaining new metric to public will present challenges

Questions:

Vimont: model sources US vs. international, uncontrollable – should be included in next round of SIP revision, more analysis needs to be included. Were 20W driving controls vs. what would have been considered anyway
Moore: parallel process – sources would be looked at anyway
Malm: IMPROVE doesn't identify sources, just looks at pollutants of interest
Moore: referring to source categories. Amount of contribution isn't as important and type of source
Malm: IMPROVE shows sulfate up/down
Moore: BART didn't greatly improve visibility. Is it cost-effective to control species for source? IMPROVE looks at species
Bret: metric to track progress disassociated with emission controls or changes in human emissions
Moore: state controls emissions, not observations
Scott: provide data and metrics

Jenny Hand: Reconstructed fine mass trends

Trends in difference b/w reconstructed and measured fine mass
Trends starting in 2005 to avoid including operational network changes
Need to rule out analysis contribution

Questions:

Warren: carbon fraction changing supported by total carbon in 1st 4 fractions, – has really changed since 2005. Linear trend by year – by factor of 2 across entire network.
Malm: asking if true equally east/west (Warren hasn't looked spatially)
Bret: contributable to emission reduction diesel?
Warren: fractions don't support that

Tony Prenni: Aerosol derived extinction trends

11 sites with aerosol and nephelometers
Good spatial coverage (will include Canada in future)
Relationship b/w measured & reconstructed good through ~2006, less confident in more recent (2013-2015)
Sulfate scattering efficiency decreasing over time (info from slide 13)
Similar trends seen in bsp calculations as seen in fine mass (measured/reconstructed)

Questions:

Warren: All reconstructed RH based on 24-hour?
Tony: no RH >90%, used hourly RH values (avg 24-hr IMPROVE) reconstructed hourly
Malm: no chamber temperature included
Bret: asked if Canada saw bias in
Keith: western site showed less bias (carbon) Egbert biased by sulfate
John M: Canada data earlier than what CIRA presented

Bret Schichtel: IMPROVE Research/Reporting Priorities

-Problems in PM2.5 and assumed aerosol components

-Changes in RHR metrics
-Possible global changes in atmosphere
Current time frame good for making changes – with changes in RHR and upcoming SIP revisions
Areas to focus on: new equation? New NC? Automated data substitutions? Quantitative RHR metrics uncertainty model? *Defined network goal of identifying trends. Can we answer that sufficiently (Scott)*
Bret believes a new equation is necessary
***Feedback**:*
Warren: revisiting equation – simple fixed coefficients, pushed by utility industry to make changes at extremes, can expect from any regression fit, possibly overcorrected. Rev 3 could start with optimize optical fit for days that you are trying to control (20% most impaired). Chemical vs. neph measurements
John Watson: have multiple equations, source compositions have changed
Malm: 1) When 2nd equation seasonal variability was included – the bias goes away w/ seasonal ROC correction. Doesn't include physical reality 2) SOA goes up and down with sulfur (isoprene 45% in 2001, 20% in 2014) Huge shift in biogenic component of organics. One could expect ROC factor could be happening (explains in the east. Not enough sulfur change in the west to make an impact).
Tom: RHR metric change – WestStar progress reports due about same time as updated SIPs. Being able to explain all changes with new equation (if happens) baseline period 2000-2004 is necessary to track progress in near term.
Bret: we're showing false progress. Is this good for states?
Tom: highly variable by site. Lots of subtleties, not one-fits-all sites approach
Bret: 3rd equation best use of resources/time?
Scott: possible to have new approach at next year's meeting
Malm: ask states if IMPROVE report is useful
Tom: will ask state members where priorities are if it's either/or new equation or report
John Watson: high priority to refine equation and understand implications
Malm: report with caveats – but useful for states to meet their needs
Bret: report could be completed 2018-2019, but likely not in time to include in SIP revisions/Progress Reports
Watson: NC change also a priority – hard to defend
Scott: auto data substitution could be easy
Tom: doesn't think it's as helpful as other priorities
Scott: can be put off another couple of years
Bret: state feedback needed before final decision on priorities is made
4 key issues to address with shortfalls of current equation
Vimont: organic fRH – assumption is ROC is culprit – could organics be absorbing water? Jenny said she accounted for that. Tracy/John Watson presentation from morning
Bret: possible to use old filters to do analysis to answer a lot of these questions. Identify experiments
Tony: O1 fraction evaporates over time.
Judy: O1 is very unstable
Bret: create workgroup of interested parties
Malm: need to resolve issue of analytical problems first!
Bret: if it's analytical there is something causing carbon loss (storage, artifact correction) Can analytical issue be ruled out?
Warren: known OC sample – test after storage
Watson: Fresno filter is as close as they've come – fractions – they know which are fire dominated, diesel dominated
Judy: Fresno samples collected in 2001 – haven't looked at trends over time (carbon fractions)
Watson: need plan to get to answer – not just reanalyze sample and show charts. Need final product
Jenny's list – form work group with list as starting point
Kristi: should there be more than one multiplier for O1, O2, etc
Watson: more oxygenated compounds have different fractions
Derek: carbon-oxygen or carbon-hydrogen ratios – compare today's to archive filters.

Need to resolve storage issues first
Workgroup shall be formed – need leader – Jenny Hand & Judy & Joann can start with ROC