NADP Planning Meeting for a Proposed Mercury Trends Network (MTN)

Organized by the NADP Ad Hoc Mercury Trends Network Steering Committee
(David Gay, Eric Prestbo, Martin Risch, David Schmeltz)
May 1, 2006; 8:30 AM until 4:30 PM
Historic Mission Inn
Riverside, California

The **purpose** of this meeting is to inform NADP members about a proposed new network to measure atmospheric mercury concentrations that can be used to estimate mercury dry deposition; to give the NADP members a chance to provide input on the development of the new network, and to offer involvement of prospective site sponsors in the new network.

For more information, please contact David Gay or Kathy Douglas at the Program Office (217.333.7871). There will be no additional charge to attend this meeting, held prior to the Spring 2005 Meeting of NADP Subcommittees. Lunch will be provided.

AGENDA

8:30 – 11:30 Introduction and Overview

1. Purposes of this meeting: information, input, and involvement
2. NADP Executive Committee initiative
3. Mercury Trends Network proposal
4. Strategy and timeline for implementation
5. Draft 12-Point Plan for New NADP Initiative for MTN
   (1) Name, advocate, objective, duration, background
   (2) Relation to mission, objective, and philosophy of NADP
   (3) New information for NADP data base
   (4) Data products needed for objectives
   (5) Field-sampling, laboratory, and data protocols
   (6) Field-data and laboratory-data quality assurance/quality control
   (7) Data quality criteria
   (8) Time, staffing, and cost demands
   (9) Funding sources
   (10) Money transfers
   (11) Operation within NADP
   (12) Transition needs
6. Transition network site sponsorship
7. Funding considerations for network expansion
8. Overview of afternoon discussions

12:00—3:00 Discussion Sessions

1. Siting and data needs
2. Network operations
3. Data management and analysis

3:30 – 4:30 Meeting summary, wrap-up, next steps, and adjourn

Minutes of the National Atmospheric Deposition Program's Planning Meeting for a Proposed Mercury Trends Network (MTN)

Monday, May 1, 2006, 8:30 AM – 11:00 PM
Historic Mission Inn, San Diego Room
Riverside, CA

With Comments

This document includes the following:

- Minutes of the meeting,
- Comments on the meeting,
- Comments on the 12 Point-Plan from both attendees and those invited but unable to attend, and
- A list of Attendees.

DRAFT MINUTES

NADP Planning Meeting for a Proposed Mercury Trends Network (MTN)
Monday, May 1, 2006, 8:30 AM – 11:00 PM
Historic Mission Inn, San Diego Room
Riverside, CA (taken by Greg Wetherbee/USGS)

Attendance: A spreadsheet containing the names, affiliation, and contact information for the attendees was created by Kathy Douglas. There were 39 people in attendance.

1. Welcome, purpose, introduction of NADP Executive Committee initiative, solicitation of input from attendees – Van Bowersox, Illinois State Water Survey, NADP Program Office.
    - 12-Step Plan has been prepared
    - Introduction of the Advocates: David Gay (ISWS), Eric Prestbo (FGS), David Schmeltz (USEPA), Marty Risch (USGS)
    - Approval of 12-Step Plan on track for October 2006
2. Mercury Trends Network proposal presented by Eric Prestbo, Frontier Geosciences, Inc.
    - Seeking peer review of 12-Point Plan. Is it adequate? How should we calculate dry deposition of mercury (Hg)? Are details being overlooked? Is the budget realistic?
    - Sampling and analysis methods are well-established (Landis, Stevens, Schaedlich, and Prestbo, 2002). Other methods were not addressed.
3. Strategy and Implementation– Marty Risch, USGS
    - Objective of MTN will be to collect data to evaluate status and trends in Hg deposition using the general model: $Hg_{wet} + Hg_{dry} = Hg_{total}$.
    - Network would use Tekran Model 1130 to provide 8 concentrations per day in automatic mode.
    - Network would also use daily composite manual sampling which requires laboratory analysis of the samplers.
    - Need dry Hg species, Hg in precipitation, and meteorological data to determine deposition velocity.
    - Monitoring locations target MDN/CASTNET co-located sites with attention to representing hydrologic units within drainage basins. EPA encourages inclusion of sites in high emission areas.
    - Starter list of sites combines 13 MDN, 24 CASTNET, 24 NTN, and 5 AIRMoN sites, which covers 10 of 14 ecoregions and 13 of 18 hydrologic units.
    - Pilot network envisioned 2007-09.
    - Opportunities exist for cost sharing and discounts
4. Introduction to the 12-Point Plan – David Gay, MDN Coordinator
    - David presented the program name, goals and objectives. The plan is not official now, but will be presented to the NADP Executive Committee (EC) in July 2006. If EC approves the plan, an Ad Hoc Committee will form to guide the design and approval process.
    - A timeline handout was provided to the attendees.
    - Timeline: 5/01/06: MTN Workshop – Unveiling of 12-Point Plan
      5/03/06: Advocates will prepare a report on meeting results
      6/15/06: Advocates will contact Workshop attendees for input
      Mid-7/06: Technical meetings for input in D.C., Chicago, Boston, and Research Triangle Park
      7/18/06: EC presentation
      8/16/06: Comments on draft solicited in Madison, WI at Mercury 2006 Conference.

9/06: Final Plan ready for distribution/vote at fall NADP meeting in October 2006.

10/06: Final costs, equipment list, data flow, quality management plan, and data management plan, standard operating procedures prepared.

- USEPA/Clean Air Markets is funding planning effort, not equipment. Individual participating agencies will be asked to join network after planning is complete.
- Carie Furiness (NC State University) pointed out that motion must be voted on by whole Technical Committee in fall to approve MTN.
- Canada is allowed / encouraged to join MTN.
- Gary Lear (USEPA) and John Sherwell (MD DNR) pointed out that agency funding cycles may not coincide with proposed schedule for startup.

5. Transition Network Site Sponsorship - Eric Prestbo stated that an Advisory Committee to include federal, state, provincial, and tribal governments and public is anticipated to look at Hg fate, regulatory efficacy, scientific studies, modeling, and policy making.
   - Eric showed a bar chart of Hg deposition indicating decreased deposition due to cessation of hospital waste incineration.
   - Data will consist of Hg concentrations and speciation, meteorology, event-based flux.
   - Sites will be a mix of locations with priority on source terms

   - Point 1: Advocates / Regulations
     Clean Air Mercury Rules in force by 2018.
     CAIR Rule in 2008. Therefore Hg emissions likely to decrease soon.
     EPA PBT Strategy calls for MTN-type network to link emissions to deposition.
     SETAC consensus document in ES&T calls for MTN.
   -
     Point 2: Relation to Mission, Objective, Philosophy of NADP
     Natural expansion from wet (MDN) to total (MTN) deposition
     Expands NADP mission
     Links with USDA via forests, aquatic communities, etc.
     Needs of other federal agencies will influence expansion.

   - Point 3: Information Added to NADP
     Ambient air Hg speciation: Hg^{o}, RGM, PHg
     Meteorology
     Event-based Hg concentrations and wet deposition flux
     Diurnal dry deposition flux

   - Point 4: Data Products
     Online database free to data users
     SOPs
     Summary Reports
     Setup / Training Manuals
     QA Plan(s)

   - Point 5: Protocols
     Manual Hg speciation based on Landis et al. (2002)
     Sample every 6^{th} day and send to a central laboratory
     Automated Hg speciation every 5 minutes

Event-based (24 hr) Hg deposition (Inferential method chosen)
Data management: Real time downloaded from internet and quarterly data available every 6 months.

- Point 6: QA/QC
  Initial visit for site setup following established SOPs
  Flow, air temperature, leak detection, blanks, calibration, maintenance, and meteorology per manufacturer specifications
  Laboratory analysis QA

Eric pointed out that the Advocates seek input on plan which can be given to Eric, David, or Marty.

Mae Gustin (University of Nevada, Reno) – There are lots of QA considerations in the monitoring equipment. Mae's project spends approximately $15K / year on maintenance, which requires 15-20 hours/week per system. Instruments are difficult to operate.

Gary Lear (USEPA) – There are concerns about network (spatial) representation. For instance, what distance is appropriate between sites? What is the radius of investigation for a site?

Marty Risch (USGS) – There is concern about creating a functional network first, then concentrate on representation.
John Sherwell (MD DNR) – There must be a way to incorporate air data into the USEPA TMDL process. USEPA Office of Water needs to talk to the Air Office. Legally, cannot use the CAA to solve CWA problems.

Marty Risch – Suggested that effort be made to incorporate Office of Water to come to planning meetings for MTN, such as the meetings in D.C. and RTP.

Eric Prestbo – We need to agree that uncertainty is large and move forward; carefully developing expectations along the way.

Gary Lear – Concerned that approach is like that of monitoring for sulfur when Hg behavior is different. May need to have clusters of sites as opposed to wide spatial distribution . Mercury monitoring is 5 years behind ammonia/ammonium, which also needs a lot more work.

Mae Gustin – Need to have uncertainties available with the data.

Kevin Cavender (USEPA) – Develop network siting to meet objectives as opposed to patching network together based on who can afford a site.

Todd Nettesheim (USEPA) – Can we address network design up front so that it isn't patched together as a "hodgepodge" of sites?

Pam Padgett (USFS) – We cannot master plan, but we can master information that the network provides.

David Schmeltz (USEPA) – Ongoing research needs to coincide with routine network operation to study/develop "ideal siting."

Marty Risch (USGS) rounded out introduction of points 8-12.

-Point 8: NADP Program Office and Mercury Analytical Laboratory (HAL) Responsibilities: Main federal agency advocates are USGS and USEPA.

-Points 9&10: Funding Sources: State, federal, tribal, provincial

-Point 11: Ad Hoc Steering Committee will be formalized with representatives from EC, Advocates, HAL, Sub-Committees, and Advisory Group.

-Point 12: Transitional Needs. Planning phase starts now. Most equipment will be purchased from URG and Tekran. Startup and operation of a transitional network is envisioned.

6. Costs – David Gay (MDN Coordinator, ISWS)
   - Sponsors can expect SOPs, QA, and data management from NADP Program Office for MTN.
   - NADP expects continued support from Advocates, commitment of site sponsors, QA, use of standard protocols.
   - MTN will be self-funded like the MDN with a cooperative structure where sites will own equipment, owners choose sites, and sites cover costs.
   - Possibilities exist for cost sharing among multiple entities.
   - Program Office will do site setup and training just like MDN.
   - Potential major site sponsors: USGS, USEPA, NOAA, DOE, NPS, USFWS, EPA-R&D, Tribes

Eric Prestbo – There are lots of measurements out there. So, the network is happening no matter what. This effort is to organize it, make data of uniform quality, and make data accessible.

Mark Nilles (USGS) – Disagreeing with Prestbo who later conceded – There is a "potential" for a network, but the network won't happen without organization.

Tom Butler (Cornell University) and Rob Tordon (Environment Canada) – Suggested making data available to modelers and certain other scientists first, then make data publicly available after 2 years of operation to allow data to be scrutinized prior to widespread use.

Stephen Hartsfield (National Tribal Air Assoc.) Supplemental Environmental Programs are providing money coming from regulated (fined) entities that could be used to fund monitoring sites, but must be connected to the fined entity.

Costs – (continued by David Gay)

New Sites		**Co-Located Sites (e.g. w/MDN)**	
Automated Sites			
Start Up			
With Equipment	w/o Equipment	With Equipment	w/o Equipment
$140K	$36K	$116K	$7K
Annual Costs			
$96K	$96K	$96K	$96K
First Year Operation			
$236K	$132K	$212K	$103K
5-Year Costs			
$620K	$516K	$596K	$487K

Costs – (continued by David Gay)

Manual Sites		
Hg Sampling Equip.	$29K	
Meteorology Equip.	$8.3K	
Sample Analysis	$200/sample	Subtotal: $29K/yr
Sample Shipping	$2K	

Marty Risch (USGS) – Added that 25% QA is built into manual site costs.

Mark Nilles (USGS) – Added that $5.5K should be added for a new electronic rain gage.

Mae Gustin (Univ. of Nevada, Reno) – Need to run duplicates on denuders, therefore double the sample analysis costs. Plus, labor should be included at 16 hours per week.

Marty and Mae each indicated that they have duplicates in their datasets for their projects. Therefore, an uncertainty analysis could be done to estimate expected uncertainty in the MTN measurements.

Costs – (continued by David Gay)

Program Office cost would be $179K/year for first year and $186K/year thereafter. This cost would be spread out over network. So, as network grows, this shared cost decreases for each site.

7. Siting and Data – David Schmeltz (USEPA)
   - Requested input on data needs
   - How do we design a network?

     State of the science is such that there are not a lot of data.

     Suggests ramping to full scale with time to avoid upfront costs.

Gary Lear (USEPA) – 70% of deposition occurs near source terms. Therefore, locating near source terms appears to be very important.

Mark Olsen (USGS, Wisc. Mercury Lab) – has 2 mobile labs.

- How do we design a network – Continued by D. Schmeltz

  Focus on source areas and build out from there.

  SETAC model is embraced for source → receptor relationship.

Mike Kolian and Gary Lear (USEPA) – Data quality objectives need to be established. Do we have enough information to infer Hg behavior? Does uncertainty obscure signal?

- D. Schmeltz (continued)

  Ideas about locating MTN sites: 1) emission sources, 2) modeled deposition areas, 3) Use coastal sites for background and Nova Scotia for "tailpipe of USA", then fill in between spatially.

Stubenville site and John Sherwell's site in MD are near lots of sources. FL has long term sites for next 10 years
VT99 has funding through 2007 for gradient work in duplicate
NJ has resources to do 1 or more sites

Which stations can sustain their monitoring or at least donate equipment?

Eric Prestbo (FGS) – Intercomparison paper in arctic circle using 2 Tekrans. Level of method maturity needs to be well documented. Risch and Prestbo (2005?) did QA work. Method was lab tested, widely used, QA challenged, and EPA approved. Filter (2.5 micron) excludes Hg from large particles, but research on these particles is available. Tekran measures Hg^o. Denuder and filters are sequentially heated to send Hg^o to detector.

Prestbo (continued) – Would prioritize skeletal network with sites such as: Mt. Bachelor, OR for background Hg. Apparently, High carbon monoxide and ozone correlated with total Hg^o and UV scattering.

Prestbo (continued) – QC will include 10 microliter injectable $HgCl_2$ in solvent to spike denuder for calibration and operation check. Other QC measures include leak checks, changing filters and impactors, denuder change, characterization of detection limit at different times of year based on ambient temperature. Must develop protocols for establishing background Hg.

Prestbo (continued) – Maintenance includes changing bulbs.

Mae Gustin (Univ. of NV, Reno) – Inject clean air manually to check zero.

Mark Olsen (USGS) – Weekly change out of glassware is trivial. Autocalibration throws data collection off 20 minutes, and one must account for that.

Prestbo (continued) – Maintenance also includes change out gold traps, which some will do in field, but many will rely on HAL. Tekran has 2 gold traps for continuous monitoring, and bias in one trap indicates leaks or other problems. Datalogger could be used to run diagnostics and troubleshoot. Need to standardize equipment component maintenance. Need a liquid-based calibration standard to inject for speciation. Are there speciation standards available?

8. Data - Marty Risch (USGS) opened up discussion of data collection, reduction, storage, and dissemination.
   - Gary Lear (USEPA) – Don't oversell product when spatial variability is likely to be high.

   - Mae Gustin (Univ. NV, Reno) - In NV, Hg^o is deposited and re-emitted from soil. Models give different results
   - E. Prestbo – Have to monitor now so that we do not miss Hg^o emission reduction.
   - Marty Risch – Should MTN post dry deposition values or deposition velocities? These values depend on model of choice.

   - Quality assurance would be done using 2 co-located Tekrans and 2 co-located manual samplers. Have to have "events". Run one sampler in total mode and one in speciated mode, where sum of species equals total deposition.

David Gay conducted a survey of the attendees to gauge receptiveness to the 12-Point Plan and MTN concept. The votes were tallied by show of hands as follows.

Evaluation of MTN 12-Point Plan	Votes
The 12-Point Plan is acceptable as presented, and NADP should pursue establishing the MTN as planned.	10
The MTN is viable, needed, and well thought out, but the 12-Point Plan needs some modifications.	14
The MTN is not a good idea.	0
Abstentions (by difference) = Undecided?	15

In the closing discussion, the general feeling of the group was that the network needed to start small as a pilot comprised of sites with existing equipment and financial support. Then, after the pilot network is established, it could be "marketed" to others to establish additional sites.

Maggie Kerchner (NOAA) – Mark Nilles and Marty Risch will be at Water Monitoring Conference in San Jose, and they should take advantage of opportunity to hit up National Water Quality Assessment personnel to get involved in Hg speciation monitoring to integrate with NAWQA objectives.

The meeting adjourned on schedule and as planned. Ice cream was enjoyed by all who were lactose tolerant and not concerned about calorie intake.

Summary of Comments from Participants
Martin Risch

Initiative and Network Development, Approval, and Implementation

A vote on the 12-point plan needs to be held at the Fall 2006 Technical Committee meeting, in addition to the Executive Committee meeting in summer 2006.

Participation in MTN by Environment Canada has been offered and is welcomed.

It would be beneficial to include the USEPA Office of Water in some of the regional meetings about MTN planned for summer 2006.

A list of potential MTN site sponsors should include USEPA Office of Research and Development, the US Forest Service, Indian Tribes.

Coordination among agencies resulting in a single network approach to mercury dry deposition is preferable to a fragmented approach by separate agencies and programs.

It should be possible to join existing atmospheric mercury species monitoring with common protocols and a common data base to form a transition network. Started small and grown slowly, this transition network should enable the MTN to learn how to run and to attract new participants.

Try to include modelers in the regional meetings where network design is discussed.

The MTN can provide a knowledge base that will influence and advance research, but should not be considered only as a research network.

Any introduction to the MTN should clearly identify gaps in the current status of dry deposition monitoring for mercury and state how the MTN will fill those info gaps.

MTN starting with 6 sites and growing to 12 in 2 -3 years is a reasonable plan for a transition or pilot network.

A draft SOP for the automated and manual systems will be needed by potential site sponsors so they can determine if they can or want to able to participate.

Will the name be retained as meaningful and representative?

If existing atmospheric mercury species monitoring efforts are to be joined into a transition MTN, the objectives of each monitoring effort should be identified and combined. The objectives of the MTN should reflect those of the transition network and should be prioritized accordingly.

Siting and Data Needs

Locations for MTN stations should include where possible, monitoring sites for priority air pollutants, so that additional data will be available for interpreting mercury.

Following previous NADP practice, at least one site in the MTN should have collocated samplers so that the comparison can be documented and the findings related to the rest of the network. This approach is preferred over trying to run collocated replicate samples at all the MTN sites.

Where possible, some of the MTN sites should near monitoring of terrestrial and aquatic mercury so that cycling and interactions can be interpreted.

Evaluate current models of mercury deposition (CMAQ, REMSAD) to identify areas that ought to be included in a design for location of monitoring stations in MTN.

Potential site sponsors will want to know the candidate locations for MTN stations, along with the estimated costs for equipment and operations.

Network Operations

A list of publications that document the development and application of the automated and manual systems proposed for the MTN are needed to reinforce that the methods are mature, well understood, and accepted for use by scientists.

The procedures and schedule for the maintenance of Tekran systems need to be written and standardized (ie. glassware, soda lime trap, impactor, calibration, gold traps, etc.).

A site audit program for MTN will be provided by USEPA through CAMD and OAQPS.

Investigate ways to lower the cost of equipment and analysis for manual systems.
There will be some competition for resources in NADP among sponsors. For example, new rain gages are mandatory and may be a higher priority for limited funds. The higher demands on data management and data quality from MTN will be a burden on existing personnel at the Program Office.

Consider making the mercury wet deposition event sampling an option to control costs.

Data Management and Analysis

It will be helpful to quantify the uncertainty associated with measurements of atmospheric RGM and PHg.

Data from a Tekran can be stored on a CR1000 data logger and uploaded to a central location for inspection.

There is value in making good measurements of atmospheric mercury species and meteorological data and archiving these data until the inferential model for dry deposition is improved. For example, limitations of single and multi-layer models may be improved by application of modified Bowen ratio and relaxed eddy accumulation methods.

Although methods for computing vertical deposition velocity and estimating mercury dry deposition have assumptions and limitations, they can be improved and should not be a deterrent against providing the dry deposition estimates. The network for the Great Lakes (IADN) takes this approach, knowing that the information will pass peer review and can be refined over time.

It was recommended that summary maps from the MTN list point estimates of dry deposition, without isopleths, due to uncertainties of representativeness.

The inferential method for computing vertical dry deposition and point estimates of mercury dry deposition should receive the review and support of modelers from USEPA and NOAA.

Summary Meeting Notes, May 1 Meeting
E. Prestbo

Action Items:

- Add in Technical meeting to timeline in DG's presentation
- Talk to Matt Landis about Stubenville status?
- 12 Point plan should make it more obvious how this will link with other programs (e.g. Office of Air, Office of Water, TMDLs etc.)
- Fix talking points to say – "Measurements will happen in the future and only through this MTN mechanism can we be sure a network will form and gain all of the benefits" --- Also we have funding in place to get the network started.
- Finish table of current, past and future measurements sites, sponsors, operators. Make sure to include ORD, USFWS
- Summarize published and unpublished Tekran or Manual QA data (intercomparisons: CAMNet, ARA, Europe etc.) Maybe Frank has a list? State of the science.
- Cost – add in cost of weighing rain gauge
- Send 1-page proposals to CAMD
- Gustin suggested that manual should have duplicate sampling – thus we need to gather all manual parallel data and summarize data quality so that an evaluation can be made. Design network to have a few select co-located sample sites as per MDN and NTN.
- Should we rename the network – can't remember exact debate but some not comfortable with MTN.
- Prestbo to gather all current SOPs and QA documents from scientists – develop a summary table (e.g. sample time, desorb time, blank correction method, etc.)

Comments Recorded:

- A majority of the Executive committee was in attendance
- Mae Gustin – big concern about methods and how dry deposition would be calculated
- GaryL/DavidS both desire more information exchange and dialog
- Sherwell – need synergy with TMDL and the water people because the driver for this is impaired water, fish and human/wildlife exposure
- GaryL – how can we know where to put sites. For example, would it be better to put a cluster of sites near a high density of power plants? Dry deposition at a single site is not going to be representative of a site even 10 km away.
- Time lag recommended for data posting to allow for Scientist to publish – 2 years may be an acceptable time
- Stephen Hartsfield (tribal coordinator) – can use industry fines directed to non-profits as a way to fund a network.
- Weiss – measure elemental Hg and use surrogate compounds to model or infer other species – i.e. oxidants. This would be less expensive but highly uncertain.
- Question: how many sites are needed to ground truth the models?
- Sherwell: Price is high so that just keeping 2 sites going would use up his entire research budget. He suggested looking at trends with weekly integrated approach and do monthly intensives.
- Todd Nettlesheim – Use SETAC Paper model – start with a few intensive sites and build upon that
- Nilles – we have trend sites now with MDN – maybe MTN should just be a researchy network within NADP
- Wetherbee – pool resources to select sites

- Discussion of models: Hg^0 easy to measure but hard to model because it is bi-directional. Dry deposition rates cannot be spatially extrapolated – only a single point. Cost of calculation of dry deposition is very small according to G-Lear. But according to Chris, getting the data through QA and in a form to make the calculations is time consuming. We don't currently have research data to support good bi-directional Hg deposition modeling. RGM and PHg are unidirectional so easier to model.
- Site Audit – CAMD would probably do this?
- Siting – needs to be informed by models
- Draft SOP needed.
- FUNDING
    - GaryL – need to see network in place will make it easier for federal and state support
    - Winston/Maggie – NOAA is talking about it big time – in budget for FY08
    - MarkN – USGS – adding in 4th effort is tough. No plans to stop current networks in place and need all resources to keep these going. High priority is maintenance, new equipment for NTN and MDN. Possible linkage with NAWQA.

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Summary Meeting Notes, May 1 Meeting

David Gay

Here are a few more notes that I had that I did not see elsewhere.

- Everyone is still worrying about what the questions is, such as
    - Is this a trends network or a hotspot network
    - People still want both kinds, if we can figure out how to do it.
- Have to maximize everyone's interest so we can get buy in to network,
- What signal is it that we want to be able to see (trends? concentrations?) and how accurate do we need to be to see that signal? i.e. can we minimize the cost and get the same answer?
- Nilles prefers we have a supersite network (I think), which would be laid on top of the MDN, but he is an advocate also.
- If we reach consensus, then we have to get an executive vote. And if we get a pass, then we have to get a vote of the Technical committee at the fall meeting (Furiness).
- An idea: since deposition velocity is a function of meteorology only, and you then multiply through by a concentration, could we not just get someone like Bullock to provide us with deposition velocities at points around, and multiply through by our concentration and then calculate the flux (DV x ug/m3 = ug/m2?). Since deposition velocity is independent of concentration?
- Problem with the name. We probably don't want to loose the advantage of a reasonably well known name that we have (MDN)

Individual Comments Received, May 1 Meeting

Mark L. Olson, US Geological Survey

Nice meeting you early this week. I wasn't sure when to chime in so here are my random comments. Many are off the cuff so if you want to call and chat either try office below or cell @ 608-335-4232.

I like the plan in general. I think starting with maybe 3 units this FY in area where they're needed but also where you have expertise. Then add maybe a few more next year and so on.

The start up and annual analytical costs of the manual systems make it more feasible to go with automated ones, especially when your getting so much more data. The RGM plumes are highly variable (see attached data slides), they could be 50 one day and 5 the next. The peaks always occur in late afternoon unless they're source influenced. I've been chasing plumes for years and still don't have a very good feel to how far that distance is, I'd be saying less than 50 km but there are so many variables to consider. This is where the trailer may be useful.

Another concern is with the manual systems and how clean they can be after shipping etc. I haven't seem Marty's data but would like to, my concern is that most of this glassware is going to have less than 3 ng of Hg on them so a little contamination goes a long way. Once again would like to know more about blanks so I can comment less ignorantly.

Cost projections for automated systems.
Most systems will need to be visited monthly by a qualified technician to perform glassware changes, calibrations, etc. Other wise the person checking on the wet dep samplers weekly, if we could use them for an hour or so, that would be fine the other 3 weeks out of the month. An hour may be light in times of troubleshooting. Then you have travel for the qual.
Tech. I feel it is a god idea to have one point person for this although when the network get's larger, that may be too much for one to handle. At that point you may need to regionalize things. My back of the envelope calc for labor for an automated unit would be 18K which includes travel for the tech. This is low because I didn't add much slop but if you could create a network where they are going from one to the next visiting a couple or all 3 in one week, that could reduce or maintain that figure. Not sure what your number was.

What we have to offer.
The trailer - this is a tool that is for hire. It's a tool that is made to be mobile, not for a long term site. It can be used to check sites prior to making them permanent and or collocating with other instruments. I couldn't come out and say you can have it on Monday, but I can say you can utilize it.

My services - I can and will help with the QA/SOP if you'd like. It sounded like EPA had funds for someone to be the point person to service the instruments - if you want me, we can discuss that. I've also got another very qualified tech that is an expert in Campbell (CR10/1000) usage and like to get him somewhat involved as a backup so everything wasn't on my shoulders. I'm not pushing for this responsibility but I would be a good candidate and may be interested if you are.

A lot of this is random, off the cuff, fresh on my mind. Call me if you'd like to discuss more.

Thanks for having me and I hope I can help in the future.
Mark

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Bart Malone, State of New York

Hi David, it was to finally meet you at Riverside. I'm sorry the outcome was anticlimactic, to many skeptics. If they understood that the Tekran is continuously analyzing channels A and B , that is a built in QA mechanism and I don't think anyone stressed that. There may be issues with the RGM and PHg but that can be worked out by the instrument designer or some grad students PhD project. At any rate, we plan to continue and I would appreciate your guidance with an SOP when it is ready.
Thanks,
Bart

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Seth Lyman/ UN-Reno/Student of Mae Gustin

As a follow-up on yesterday's meeting, I wanted to pass on a few ideas I had about your proposed Mercury Trends Network:

1. As you organize the network, remember that instrumentation for trace mercury analysis is not as easy to operate as many other systems for gaseous analysis. In our lab, we spend several weeks training new employees to use a Tekran 2537A and several months training employees to use an 1130/1135 speciation system. In many cases manual denuders can be even more tricky to use than automated systems, especially in terms of blanks, flowrate, installation, etc. I know the operators of Nevada's MDN sites personally, and it took months for them to learn the relatively simple protocols of MDN. One of the operators has a PhD in biochemistry, and still his first two months of data were contaminated because it took a while for him to get the trace-clean procedures down. If you intend to have ordinary site operators use either your automated or manual gaseous mercury speciation systems, you will have to have some kind of training camp or certification and re-certification protocols in place, etc. in addition to a strong technical support system at Frontier or somewhere else that is capable of doing on-site training and troubleshooting.
2. With regards to modeling mercury dry deposition, you will need to talk to the experts in the field before you choose or impliment a model. I am not an expert in the field, but I have read enough papers on dry deposition of mercury species and dry deposition modeling in general to know that these techniques are far from cut-and-dried even for well-characterized species like SO2 and ozone. The assumptions you will have to make in implementing models to predict behavior of gaseous elemental mercury and RGM may be so uncertain (or entirely unknown) so as to make it impossible to justify your results. These assumptions that you would have to work in your models are the things I think you will want to research thoroughly before you take any real step forward in actually putting the models together. Really the mercury field is a little ways off from even being able to make useful direct measures of deposition of mercury species because the instruments have so much variability relative to the gradients being measured (at least that's what a lot of people think, in spite of the number of papers in circulation that use modified Bowen ratio to estimate Hg0 and RGM surface flux). Verifying a model by direct measurements will be impossible until some people take the first step of making good, reliable micromet measurements of mercury dry deposition so an understanding of the relationship between flux and meteorological parameters can be formed. Mercury dry deposition models you may construct before that point might still be useful - they should just be approached with a great deal of caution, in my opinion.
3. We are really excited about the MTN network. Good luck in pulling it together.

Comments from Invitees, Before the May 1 Meeting

Eric Miller, Mar 30, phone conversation,

thinks it is wonderful that we are progressing on this idea. However, he is very leery when it comes to determine dry deposition with the data; more specifically that we would produce a modeled number with a simple model and get it very wrong. He, doing his flux method is seeing lots of re-volatilization of elemental; therefore the dry deposition of elemental value is probably going to be wrong. It would seem that he wants there to be a much more sophisticated modeling effort here.

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Mark Cohen, Ph.D., NOAA Air Resources Laboratory, email 4/14/06

Thank you very much for your generous invitation. I am extremely pleased that NADP is considering a new suite of mercury measurements. Unfortunately, I will not be able to attend the meeting. However, my close colleague Winston Luke -- an experimentalist at ARL -- will be attending the meeting. He and I will be spending all next week on a trip through the Gulf Coast looking at locations for a site (or sites) that NOAA will be setting up to measure speciated mercury concentrations and dry deposition... Winston is already very knowledgeable about all this, from an experiment and modeling perspective. But just to be sure, next week I promise to pester him relentlessly with my "model-oriented" approach to these issues. Together with his extensive field and laboratory expertise, and the burgeoning NOAA mercury measurement program that he is spearheading, Winston will be able to make a significant contribution to the meeting. That is, as long as I haven't driven him crazy next week :)

I will of course be more than happy to give comments on any plans or outlines being considered.

I only have a few minutes this afternoon, and I think that all involved are well aware of all of the following, but, in a nutshell, a few of my concerns -- from a modeling point of view -- are these (not necessarily in order of importance):

(1) speciated concentration measurements are essential for model evaluation -- we currently don't have adequate data to even know how well we're doing, much less try to improve the models; so, whatever is done, if there is more data -- and the data are available -- it will be helpful!!

(2) maybe this is a dream, but eventually it'd be nice to get data on the actual species, e.g., what compounds are in "RGM" at a given location, and what are their relative concentrations?

(3) humidity and phase-partitioning is important and not well understood. I don't think we know, for example, if the RGM dissolved in droplets is measured as RGM or Hg(p) in a Tekran.

(4) RGM concentrations would be great... And if Hg(p) and Hg(0) measurements could also be made, all the better. This is a dream, of course, but for modeling dry dep of particles, or even using the inferential technique, one would like to have some data on the size distribution of particulate mercury.

(5) as everyone is well aware, RGM is very sticky and dry deposits readily, so there are a lot of data interpretation issues especially when the data are taken near the earth's surface... So, extra care must be given to make sure that we know what we're measuring... For example, there may be a big difference in

concentration at different heights above the ground (e.g., 2 meters vs. 5 meters) the ground, because of the large gradient present due to rapid dry deposition... Another point related to this is that it'd be extremely useful -- but admittedly difficult -- to get data at different heights, including some heights more distant from the surface -- 50m, 100m, and higher. Maybe a tethersonde?

(6) in my opinion, the concentration measurements are essential. The concentration numbers are the essential data for model evaluation. Dry deposition estimates can be made using the inferential technique. In some cases, it may be possible to try to "measure" dry deposition. This is fine, but in my opinion, if tradeoffs have to be made, I'd rather have a lot of concentration measurements rather than a few dry deposition measurements. My sense is that short-term measurement-based campaigns (e.g., flux gradient method) could be used to test the validity of inferential concentration-based dry dep schemes. If the inferential schemes work, then great. If not, then they have to be improved or another approach developed. But if we can "get away" with the relatively simple inferential approach, then we can end up having more monitors...

(7) from a back-trajectory point of view, having discrete short-term samples is key. However, from the point of view of doing comprehensive inventory-based "forward" dispersion modeling like I do with HYSPLIT or the EPA does with CMAQ, having continuous measurements may be more important. This is because, for example, one doesn't want to barely "miss" a peak in time and think that the model is worthless, when in fact it just missed the peak by a few hours. The bottom line is that from my point of view, it'd be better to have continuous samples (e.g., weekly?) rather than discontinuous samples (e.g., 12 hours per week). Obviously in the best of all possible worlds, we'd have continuous samples of shorter duration. In fact, if we could have hourly values, that would be incredible. That's more or less what you can get with Tekran's... Although its probably not practical or affordable to base the whole thing on Tekrans...

Well, I'm sure I'm forgetting something, and I hope the above was not written so fast as to be unintelligible... But the above are some of the issues that I would likely bring to the table if I were at the meeting. I know that there a number of other considerations, so certainly compromises of one kind or another will have to made. And ultimately, the current dearth of data is so awful, anything will be very much appreciated...

In case they might be helpful, I've given a few recent presentations that have explicitly included a discussion of measurement needs from a modeling perspective.

* The most recent was last Nov in Frostburg:
http://www.arl.noaa.gov/ss/transport/cohen.html#item38

* In 2003 at an NADP meeting in D.C.:
http://www.arl.noaa.gov/ss/transport/cohen.html#item8

* And in 2002, at an EPA PBT meeting:
http://www.arl.noaa.gov/ss/transport/cohen.html#item7

And as mentioned above, we at ARL (Winston Luke, Steve Brooks, and myself) are going to be establishing one or more Hg measurement sites very soon... I hope that these will be able to contribute in some way to a new network.

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John Schakenback, USEPA, phone call, 4/25/06,

He got a few comments back from Matt Landis/EPA who seems to be reasonably supportive of the network. Here are the highpoints of what John passed on.

- ORD has quite a bit of QA/QC for operation of the TEKRAN system that they have developed over the years, and he is willing to provide this to us, to use, for this project. ML thinks it needs to pulled together into one document for the field folks to use (as we had planned to do already SOP Field Manual)
- Perhaps JS could review the QA/QC materials or our version of it (or have it peer reviewed) for scientific consensus on how we are monitoring. Something we had also thought about.
- JS is working with NIST to develop an Hg 0 transfer standards (a unit called an Hovacal) that would be very useful for us. It is at least possible that this unit might produce Hg0 and Hg+2 streams.
- Perhaps EPA could provide for one year audits of the Tekran or support that work.

We also discussed the modeling question, and I suggested (speaking for myself) that modeling to dry deposition needed to be done, and perhaps EPA could help support that effort also.

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Bob Larson, NADP, 4/30/06

Bob had two comments on bringing in data from the TEKRAN automated sites.

1. that all the sites have different computing on their ends of the computer/Tekran and it would make Bob Larson's job much easier if everyone provides the data in the same format for us to use. IE that everyone produce one file with the same format, or dump into the same Campbell scientific data logger so that it is the same operation to grab data for every one. *Campbell option will be more expensive; makes more sense for us to say put a text file in this location in this format; we will provide a windows program to do this.*

Listing of Attendees

Van Bowersox	NADP Program Office, Illinois State Water Survey
Jack Butler	Cherokee Nation
Tom Butler	Institute of Ecosystem Studies and Cornell University
Ryan Callison	Cherokee Nation
Linda Candelaria	Santa Ana Regional Water Quality Control Board
Rusty D. Day	National Institute of Standards and Technology
Kathy Douglas	NADP Program Office
Steve Drevik	Agilaire
Rhys Evans	Ecotech
David Gay	ISWS
Mae Gustin	University of Nevada
Cari Furniness	North Carolina State University
Stephen Hartsfield	National Tribal Air Association
Maggie Kerchner	NOAA
Michael Kolian	US EPA
Bob Larson	ISWS
Christopher Lehmann	Illinois State Water Survey
Preston Lewis	New York State DEC
Charles J Lippert	Mille Lacs Band of Ojibwe DNRE
Winston T. Luke	NOAA/Air Resources Laboratory
Seth Lyman	University of Nevada, Reno
Natalie Latysh	USGS
Patrick Bart Malone	NYS DEC
Lisa McClain-Vanderpool	US EPA Region 9
Kristi Morris	NPS
Todd Nettesheim	EPA Great Lakes National Program Office
Mark Olson	USGS
Pam Padgett	US Forest Service
Eric Prestbo	Frontier GeoSciences
Martin Risch	USGS
Bruce Rodger	Wisconsin Department of Natural Resources
David Schmeltz	EPA
Eli Scott	US Forest Service
John Sherwell	Maryland DNR
Andy Tolley	Ecotech
Rob Tordon	Environment Canada
James Trochta	Wisconsin Department of Natural Resources
Gerard Van der Jagt	Frontier GeoSciences
Pavlova Vitale	RWQCB - 8
Peter Weiss	UW-Bothell and UC Santa Cruz
Gregory A. Wetherbee	USGS