

MINUTES
ENWRA Spring Technical Meeting
Monday, June 17, 2019 10:00 am -12:00 pm
Lower Elkhorn NRD Board Room
1508 Square Turn Blvd
Norfolk, NE

Attendees (22):

Brian Bruckner (Lower Elkhorn NRD [LENRD]), Annette Sudbeck (Lewis and Clark Natural Resources District [LCNRD]), Myles Lammers (LCNRD), Paul Woodward (Papio-Missouri River NRD [P-MRNRD]), Dick Ehrman (Lower Platte South NRD [LPSNRD]), Dan Schulz (LPSNRD), Daryl Andersen (Lower Platte North NRD [LPNDRD]), Dallas Dorey (LENRD), Mike Sousek (LENRD), Sue Lackey (University of Nebraska-Lincoln, School of Natural Resources, Conservation and Survey Division [UNL CSD]), Mike Murphy (LENRD), Carrie Wiese (Nebraska Department of Natural Resources [NeDNR]), Joslynn VanDerslice (Upper Elkhorn Natural Resources District [UENRD]), Chris Hobza (US Geological Survey [USGS]), Steve Peterson (USGS), Jim Cannia (Aqua-Geo Frameworks, LLC [AGF]), Jared Abraham (AGF), Chuck Wingert (Nemaha Natural Resources District [NNRD]), Jesse Korus (UNL CSD), Philip Paitz (NeDNR), Katie Cameron (Eastern Nebraska Water Resources Assessment [ENWRA] Coordinator/UNL CSD), Dustin Wilcox (NRD/NeDNR liaison – call in)

Financials:

The May 23, 2019 pre-meeting ENWRA memo and June 17, 2019 meeting handout included a Fiscal Year (FY) 2019 table with both the original budgeted amounts and best projected FY end actual spending columns. The FY2019 table reflected ~\$330,000 in the account at the end FY 2019 **[UPDATE: Following the ENWRA meeting, the final FY2019 ENWRA invoice processing, bank interest deposit tally (previously unaccounted for), and double check with LPSNRD accounting: ENWRA’s account held **\$342,278** for the start of fiscal year 2020.]** For FY2020, the equipment maintenance spending was increased to match the approximate amount spent in FY 2019 and then \$20,000 was added for replacing the Ashland well nest lost in the March 2019 flooding (there will be potential FEMA reimbursements through Papio-Missouri River NRD). There are 2 test hole credits totaling \$18,300 (LCNRD, P-MRNRD) and \$16,200 for AGF collaboration services on getting ENWRA AEM into one coordinate system on Nebraska GeoCloud (going through LPSNRD on ENWRA’s behalf at July 24, 2019 meeting). An \$80,000 placeholder for possible new project spending/grant applications was also included. **[UPDATE: ENWRA’s FY2020 budget went through the LPSNRD budgeting process on ENWRA’s behalf June 19, 2019 (draft#1 approved).]**

Activity Updates:

Airborne Electromagnetic (AEM) data, reports and flights:

Lower Elkhorn, Nemaha and Papio-Missouri River NRD 2018 Flight Reports have been delivered by AGF. The Lower Elkhorn and Nemaha reports have been posted online (Papio-Missouri River NRD report is pending final edits before going live). The Lower Platte North NRD report is expected in July 2019, Lewis and Clark at the end of August 2019 and Lower Plate South NRD in November 2019. The 2018 AEM chapter report deliverables reflect the new simplified data dots in Google Earth mentioned at ENWRA's January 2019 Legislative Conference Meeting.

Test Holes/Monitoring Well Installations

Two of the 5 deep Dakota holes in Lower Platte South NRD are done with CSD (a wireline core has been advanced beside one of the rotary holes), the Nemaha NRD started subcontract drilling and 10 of the 20 holes near flight lines are done. The Papio-Missouri River NRD Year-3 test holes with CSD are planned for September 2019. Both Lewis and Clark and Papio-Missouri River NRDs are planned for \$9,150 check payments from ENWRA prior to June 30, 2020.

Nebraska Department of Natural Resources Update – Philip Paitz

Lower Platte Missouri River Tributaries (LPMT) model activities:

DNR's numerical GW model for LPMT came out December 2018. There are 2 layers: principal aquifer and bedrock aquifer units. The LPMT has ½ mile by ½ mile grid cells, one steady state 26 transient annual and 336 transient monthly stress periods in 50 year simulation cycle with last 127 repeated to get 600. It is a water shed model with well, recharge, stream flow routing, river and evapotranspiration (ET) packages to simulate pumping and recharge. Geo data used were CSD logs, NeDNR well logs. Zonation (59 zones – 5 TB of data [59 down from 100]) to aid in analysis and look at different groupings & hydrologically connected areas (HCAs), HUC 10 grouped by tributary, some loose in LCNRD looked at digital elevation models [DEMs] and grouped them with nearby trib. NeDNR QAQC'ed to see where did it behave and where not? Where did it break down and where did it work well? The NeDNR is using the LPMT model to determine HCAs and it is being incorporated into SUSTAIN and the CIR calculator. NeDNR will hand off .csv files, SDF curves, and metatdata for zones at the end of summer and will work with NRDs back and forth on well cycling results before the HCAs get published out.

Lower Elkhorn NRD Wayne County Study – NeDNR and LENRD contracted with JEO, Long Spring Consulting (Mahesh) and WSP (group now with Leonard Rice Engineers, Inc. [LRE]) on a subregional area within the LPMT Model boundary around Wayne, Nebraska. The available AEM was used to update the geologic framework. The group tried to preserve the LPMT as much as possible but changed the Modflow USG (unstructured grids allowing for more appropriate discretization of the area) to 5 layers and used ¼ mile by ¼ mile local grid refinements. LRE group had to do some additional work with getting Niobrara formation differentiated from the aquifer bottom but the extra work got figured out, LRE group captured the complexity of the area, and it was beneficial learning for future approaches in the long run. The results came out 1.5 months

ago and the NeDNR indicated the east looked better and overall the results showed a small improvement to LPMT model, but the NeDNR will continue to evaluate if it was a true improvement. NeDNR is simulating pumping in 2-5 layers through the modifications for smaller cells, finer grid and will work through a handful of scenarios to see how it reacts. This project was a Round 1 to demonstrate the value of using geologic framework informed by the AEM and although there were challenges and internally the NRD could be skeptical on a few things (Sue Lackey of CSD provided preliminary input to LENRD), overall the process had value and they want to go to Round 2 to fine tune the geo layers to better represent reality in the cells and upscale to the whole District area evolving the process further.

Nebraska GeoCloud (NGC) – Dr. Jesse Korus

Status Update:

The NGC work has been steady progress has been made on the NGC project with April 1, and 2, 2019 Know Geo workshop held in Lincoln and I-GIS presenting with attendees uploading to the NGC during the session. Jesse Korus gave a power point going over status and key features of the NGC work. I-GIS is still working on refinements to the 3D Viewer and we are holding the last of the contract payments until those are ready.

WSF Submittal:

A July 2019 ENWRA WSF Submittal was discussed. Please refer to the May 23, 2019 ENWRA memo regarding CSD's next step recommendation to prepare a unified base geologic model available as a product on the NGC to support future efforts. Discussions regarding NRDs and other stakeholders, scope details, costs, having a coordinator and steering committee (core tech team) in place to ensure the upkeep and usage of the NGC were all discussed with different NRDs having input (boards, politics, and science considerations all mentioned). **[Update:** between the June 17th meeting and July 15th, a draft Section D of the WSF was prepared and groundwork toward drafting the application was conducted; however, based on scope-to-cost considerations, workload uncertainties, and discussions between partners, this July proposal was tabled for a later potential submittal and/or more scope refining activities later this fiscal.] Additionally, ENWRA plans to meet in fall 2019 again for Long Rang Plan (LRP) updates and potentially an NGC coordinator and/or NGC steering group will be kicked off/in place by then aiding in the next step of action for ENWRA to handle its data management goals through the NGC (initial preparation of a workplan document in the meantime maybe?).

Upcoming Activity Discussions

- NeDNR should have more to present on HCAs after working through model scenarios this summer. Philip indicated NeDNR would likely have no problems with child models and knows it is a coordinated effort (we all have same world of data for the region, if we can avoid dragons and pull consistent things across Districts together that would be good).

June 17, 2019 ENWRA Technical Meeting Minutes

- NRDs have related projects going on: Papio-Missouri River NRD is going for more flights in the Fremont, Nebraska area and relative to paleochannel near Arlington. The Nemaha NRD is planning additional flights to be mobilized with the Papio flights, both NRDs are going for small project grant applications. The LENRD has the groundwater model work round 2 also as a grant application planned through the WSF. The Lower Platte North would like to use the AEM to define nitrate areas, potentially also using vadose results with groundwater results (**updated** after meeting).
- Long Range Plan (LRP) Update – form plan for fall 2019 (please keep September 2019 timeframe in mind)- specific projects or objectives NRDs want to include for ENWRA in the next 10 years
- Presentations (Update to Managers August 27th -28th Retreat, AEM presentation at NRD Legislative 2020 and other AEM presentations, ENWRA Updates to Boards - cycle back again starting with the Papio-Missouri River NRD)

12:00 Recap and Adjourn

MINUTES
ENWRA Long Range Plan Meeting
Wednesday, December 11, 2019 10 am to 12 pm
Papio-Missouri River NRD
Omaha, Nebraska

Attendees (17):

Annette Sudbeck (Lewis and Clark NRD [LCNRD]), Myles Lammers (LCNRD), Amanda Flynn (US Geological Survey [USGS]), Chris Hobza (USGS), Carrie Wiese (Nebraska Department of Natural Resources [NeDNR]), Bob Hilske (Nemaha NRD [NNRD]), Chuck Wingert (NNRD), Brian Bruckner (Lower Elkhorn NRD [LENRD]), Dan Schulz (Lower Platte South NRD [LPSNRD]), Dick Ehrman (LPSNRD), James Cannia (Aqua-Geo Frameworks, LLC [AGF]), Daryl Andersen (Lower Platte North NRD [LPNNRD]), Dustin Wilcox (Nebraska Association of Natural Resources Districts [NARD]), Jesse Korus (University of Nebraska-Lincoln, School of Natural Resources, Conservation and Survey Division [UNL CSD]), Marlin Petermann (Papio-Missouri River NRD [P-MRNRD]), Paul Woodward (P-MRNRD), Katie Cameron (Eastern Nebraska Water Resources Assessment [ENWRA] Coordinator/UNL CSD)

Recent activity:

Test Holes/Monitoring Well Installations:

- ENWRA has cycled through the NRDs getting \$9,150 for test holes advanced along AEM flight lines and we will be through all NRDs getting reimbursed twice by the end of fiscal year 2021 (FY21) providing LENRD and LPSNRD are the last two paid out (FY21). Many test holes were done in 2019 (NNRD did 19 as part of an NET grant, LPSNRD did 5 deep Dakota holes, P-MRNRD did Dakota holes - there is one left for spring in the northern part of their district to close out the 3-year agreement). Reminder the \$9,150 covers any hydrogeological study efforts covered under the Long Range Plan (LRP) that the NRDs desire to use it for (example: wells, equipment etc.). **[UPDATE: 220 CSD test holes have been advanced within the ENWRA boundary since 2006 (Figure 3 of LRP), 178 sponsored by ENWRA NRDs (38 for LCNRD, 25 for LENRD, 10 for LPNNRD, 5 for LPSNRD, 28 for Nemaha, 26 for PMRNRD, 45 for ENWRA.)]**

Pilot Study Sites

- Thank you LENRD, LPSNRD and USGS for getting the ENWRA annual sampling done at Ashland, Oakland and Firth. Several transducers (aging fleet) and pumps (two at ASH03 and one at FIR04) have been replaced. We are looking to stay under the planned budget for equipment maintenance. Our AquaTroll 600 unit has been running in blank water to test calibration and will be deployed at the Firth site at the FIR06-40 well with known fluctuating nitrate levels. The ASH01 well site (cluster of 4 wells) that was lost in the flood has been replaced in similar setting south of the former location (Ashland pilot block HEM and downhole geophysics were reviewed on the power point slides for reference). Paul Woodward is taking care of the FEMA reimbursement related to those costs and ENWRA will pay the P-MRNRD for the remaining unreimbursed costs (possibly yet in FY20, maybe in FY21).

Water Sustainability Fund (WSF) Natural Resources Commission (NRC) Projects– Status due in March 2020

- Award #5189 – 2018 AEM Flights: NRDs have paid and received reimbursements from ENWRA for 5 of the 6 reports **[UPDATE: LPSNRD has paid and received DNR reimbursement through ENWRA in January 2020 and ENWRA was provided overarching AEM report for the 2018 AEM flights - closing out all contract work with #5189].** Darcy Boellstorff worked on getting our AEM “as flown” flight lines organized with GIS attributes and renamed to match the line IDs presented in the reports over her sabbatical award term. Darcy did not get the work fully completed but she indicated what is left to do and offered one of her GIS students to continue with an internship if ENWRA was interested (coordinator will follow up with the partners on this).
- Award #4125 – Secondary Bedrock Sampling and Age Dating: Amanda Flynn of the USGS provided an update to the group that the lab and age dating results are posted on NWIS and letters were sent to

landowners at the sample locations. A presentation is planned for the partners in the next 3 months as the report is in review and planned for publishing at the end of September 2020.

- The Award #4164- the Nebraska GeoCloud (NGC): Jesse Korus and USGS are working with I-GIS and AGF to get data uploaded to the NGC (27 projects, 24,000 line km, 300,000 depth soundings are already uploaded). **[UPDATE: NGC activities to date summary sheet attached]**. Preliminary Standards and Guidelines document is in progress with a goal of having at least a draft available June 30th 2020. The special Nebraska Viewer was upgraded to connect with the cloud. There was discussion on the value and format of the workshops with the thought that workshops will continue, maybe in mobile format where NGC team goes to the NRDs. The hope is to expand past the 10 NRD interlocal group. Other NRDs might see the value in having 3D geological models and/or having their borehole or point data available in a statewide platform with file storage, uniform upload/download/export formats, and visualization capabilities in a 3D environment. The group also asked the price for a Geoscene3D license (\$12,000 for basic builder, could go up with add ons from there). **[UPDATE: coordinator requested after this meeting that the partners allow for ENWRA to purchase a Geoscene3D builder license for the coordinator to use in AEM inquiries on behalf of the NRDs – the ~\$12,000 for this exceeds the \$2,775 we have allocated in the coordinator position CSD agreement for software – the \$12,000 could be built in next year's FY21 budget or just go over for this fiscal.]** Coordinator will draft a CSD ENWRA interlocal 2-year bridge contract to match up with the proposed NGC contract schedule and a coordinator position 2 year bridge contract also so all ENWRA contracts are on the same 5 year cycle. The consensus from ENWRA NRDs was to draft a 2-year interlocal agreement to have ready at the Legislative Conference to continue the NGC maintenance forward (same + or - \$3,400 per year #s we have now) as a bridge until a 5-year agreement can be drafted. The next 5-year agreement could cover potential additional capabilities beyond the basic storage and availability of projects in the cloud (items like: a coordinator, supporting dataset enhancements, getting all the available boreholes summarized into consistent descriptions, and items that could ease getting the AEM data incorporated into groundwater models).

Financials:

Reviewed ENWRA account FY20 budget items allowing for just over \$320,000 estimated bank in the ENWRA account for the start of FY21 (presentation slide also included previous year table budgeted VS actual from technical meeting back in June).

Long Range Plan (LRP) Discussions:

A draft version of the LRP with newer updates made in red text and updated figures was provided as a handout. Group went over the updated maps and the matrix table from our June 2019 meeting. Discussion on the Figure 3 Priority Mapping Areas map included NRDs reasoning behind areas shown in green and the plan to take off/modify certain green polygons and update map (technical committee will get an updated Fig. 3 for review). Daryl mentioned NRDs doing extra studies on nitrates (areas not depicted on the priority mapping Fig. 3). Section 4a in the objectives matrix table regarding Hydraulically Connected Area (HCA) evaluations was mentioned. Some partners suggested adding geological model and HCA evaluations as upcoming budget items for ENWRA (as we did in the past with data management, now a \$25,000 routine item). There was discussion on what projects are ENWRA funds versus NRD funds. The consensus was projects should cross NRD boundaries to use ENWRA funds but the coordinator can still assist with projects and a new FY21 budget item was not established. There was discussion on future project timeframes and 2025 being the basin wide plan new increment and getting geologic models and NRD's pilot work with AEM and the NeDNR Lower Platte Missouri Tributaries (LPMT) Model by 2023. This meeting was the last call for changes/discussions/additions to the 2019 LRP update, email coordinator if you have more after digesting meeting discussions. Coordinator will email the technical committee a copy with all the red text changes made before circulating this version to the full group in March 2020.

ENWRA Partner Agency Updates:

- **USGS – [UPDATE:** Amanda was reviewing what data was available for aquifer chemistry in general in the ENWRA area and observed a gap in data/inventory/understandings available for domestic wells and potentially newly installed monitoring wells. Over 4,500 domestic wells, serving approx. 53,000 people, have been installed in ENWRA since 2006, and of those 4,500, 2,800 are more than 1 mile outside a wellhead protection area boundary. These areas would be more likely to not have water quality data, but could be areas that impact wellhead protection areas in the future. While data has been collected in the past across the NRDs, aquifer development and water level changes can affect water chemistry and Amanda has seen evidence of well field operations and drought/flood conditions affecting surrounding well chemistries. Amanda plans to have a pre-proposal document for the partners to review in January or February.]
- **NeDNR – [UPDATE:** Jesse Bradley indicated the NeDNR is still interested in expanding transducer networks with ENWRA to add transducers to monitoring water level changes over time for observation of trends.] The NeDNR is also still interested in looking at different areas like LENRD did at Wayne and Lower Platte North did at SQS#2 for incorporation with the LPMT model work.]

Upcoming NRD Legislative Conference:

The Legislative Conference is planned for January 27th through January 29th 2020 and ENWRA will be a sponsor for the event with a presentation time slot and tradeshow space. The group discussed what is needed for the Conference by January 10th 2020 (Dustin Wilcox indicated the typical order Tradeshow Tuesday, talks on Wednesday):

- Full page ad (3.5" wide x 8' long)& Logo that can be used for signage
- For the 45 minute break out session: Title of your session, Who will be presenting, Short description of the session, Any audio visual needs

The partners indicated the advertisement should be catchy, needs a hook to get people in the tradeshow and to our talk as we are up against competing tradeshow rooms. Maybe have a running slideshow or movie on the wall and get the word out for our talk session Wednesday. The Wednesday presentation should have 5-10 background slides, show how the AEM evolved over time, have 3 to 5 examples of how NRDs are using it (public inquiry example) and talk about future plans with partners available for Q&A. Instead of calling on people or having a bowl people put questions in, we can be ready with example questions and encourage Q&A. Example perspective to think about when promoting our booth and talk: what can you/flight data do for me? We should have interactive stations set-up where tradeshow visitors can look at the Google Earth data, AEM reports, NGC, website etc. NRDs-coordinator will correspond after the meeting. **[UPDATE:** brochure full page ad that will be in the conference booklet attached]. Group indicated Jesse Korus could be the second conference attendee registrant and run the NGC examples on a computer in the tradeshow and try to get more NRDs signed on for a the next NGC interlocal.

Upcoming Notes: The ENWRA Tradeshow Booth and Breakout Session presentation at the upcoming NRD Legislative Conference will serve as the ENWRA Annual meeting. ENWRA plans an update each of the ENWRA NRD boards in 2020 (last updates were in 2018, ENWRA plans these every two years).

Adjourn

Report of Accomplishments for Nebraska GeoCloud (NGC) and Airborne Electromagnetic (AEM) Data Integration · WSF Application #4164

Data Inventory

- ~30,000 km of AEM data and project deliverables added to NGC

Nebraska GeoCloud and GeoScene3D Developments

- Expandable framework for long lifespan and further developments
- Versatile database structures
 - AEM
 - 2D grids
 - 3D grids
 - Borehole drilling information (lithology, well construction, water levels)
 - Borehole geophysical logs
 - Point data
 - Shapefiles
- Nebraska GeoCloud Web user interfaces
 - Data administration (upload data files and associated metadata)
 - Data map (browse, explore, and download data through interactive map)
 - User administration (user role, permissions, new user invitation, and password reset)
 - Projects administration (create, upload, and share GeoScene3D projects, reports, and a variety of file types)
 - Projects map (browse, explore, and download GeoScene3D projects, reports, and a variety of file types)
- Customized Nebraska GeoScene3D viewer
 - Web data portal for connection to GeoCloud
 - Extended functionality for profile views and custom color scales

Training and Education

- Workshop 1 (August 15 – 17, 2017)
 - 2.5 day training on Nebraska GeoCloud and GeoScene3D in Lincoln, NE, featuring guests from I-GIS in Denmark
 - Attended by 32 groundwater professionals; 18 Continuing Education Units (CEUs) offered.
- Workshop 2 (August 7 – 8, 2018)
 - 2 day training on Nebraska GeoCloud and GeoScene3D in Gothenburg, NE

- Attended by 28 groundwater professionals; 18 Continuing Education Units (CEUs) offered.
- Workshop 3 (April 1 – 2, 2019)
 - 2 day training on Nebraska GeoCloud and GeoScene3D in Lincoln, NE, featuring guests from I-GIS in Denmark
 - Attended by 21 groundwater professionals

Hydrogeologic Investigations

- Platte and Colfax Counties
 - Data assembled and checked for quality and consistency
 - GeoScene3D project created containing boreholes, AEM, groundwater levels, and supporting information
 - 2D and 3D grids created for selected areas
 - Project used in Workshop 2 for hands-on training
 - Completed validation study of hydrostratigraphic modeling methods (MS thesis)
 - Recommendations provided for future modeling efforts
- Bazile Groundwater Management Area (BGMA)
 - Data assembled and checked for quality and consistency
 - GeoScene3D project created containing boreholes, AEM, discrete groundwater levels, water-quality, and age tracer data
 - Released previously unpublished groundwater age tracer data
 - Interpreted continuous groundwater levels, water-quality, and age tracer data to understand water movement and groundwater vulnerability
 - Recommendations provided for future groundwater monitoring within the BGMA
 - Final report currently in review

Standards and Guidelines

- Finalized standards for coordinate system, AEM file naming and metadata
- Draft standards in progress for grids, shapefiles, boreholes, and point data
- Draft document in progress containing guidelines for AEM surveys and hydrogeological modeling
- Procedures developed for mapping the bedrock surface using boreholes and AEM data
- Procedures and codes developed for assigning keywords and hydraulic property estimates to borehole lithology descriptions

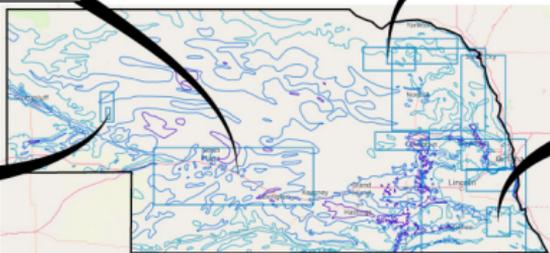
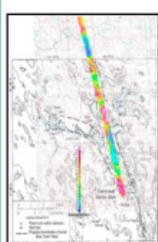
ENWRA

EASTERN NEBRASKA WATER RESOURCES ASSESSMENT

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Please visit our show room Tuesday afternoon,
presentation session Wednesday:
Status of AEM and Q&A with ENWRA Partners - Featuring:

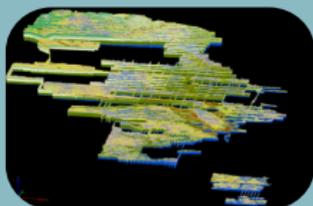
Nebraska GeoCloud: A Statewide Web Tool for:
geophysics • geology • GIS • download • upload • discovery



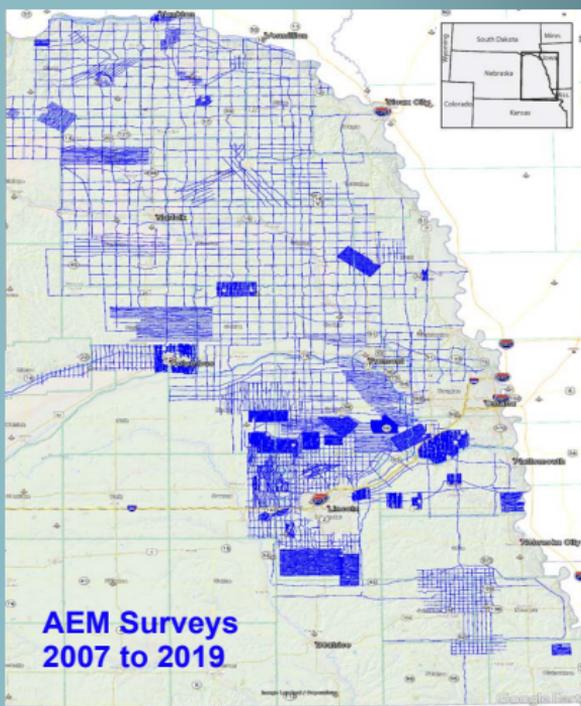
Drill



Monitor



Interpret



Fly

