

Meeting Minutes

**Engineering/Minerals
Tonto National Forest
Phoenix, AZ**

To: Project Record

From: Donna Morey, SWCA

Re: Resolution Groundwater WG #8 Meeting 5/15/2018

Attendees:

USFS: Mary Rasmussen, Greg Olsen, Tim Stroope

SWCA: Chris Garrett, Charles Coyle, Donna Morey, DeAnne Rietz, Nick Enos, Gabi Walser, Joe Frank, Mike Henderson

RCM: Mary Morissette, Cameo Flood, Jim Butler, Vicky Peacey, Chris Pantano, Gustavo Meza-Cuadra, Doug Oliver, Tim Bayley

AGFD: Jim Ruff

ADWR: Bret Esslin

EPA: Patrick Kelly

Handouts:

GW #8 Agenda

WSP PowerPoint (48 slides)

Handout for GDE Overview approach

Discussion:

Introductions

8th meeting of this group, need to wrap up analysis

Alternatives – 7 and 8

Upper Mineral Creek – proposed by BLM but does not pass screening as a beneficial site

Skunk Camp – proposed by BLM, will be ASLD and

Staff change – Joe Frank retiring May 2018, Gabi Walser will transition to BGC Engineering and will continue working on project.

Technical Memos

New water balance – new will have a flux number across Devil's Canyon. RCM hopes to submit 5/25, could reissue modified table early prior to reviewed report.

Gabi no concrete next steps, but to fill in placeholders as it comes in.

1. Parameter values – hydraulic connectivity (have new pumping test to hydraulic connectivity but would like updated tables with zones in model and hydraulic & storage values for cells. Need output figures showing zones & hydraulic connectivity values.

2. Boundaries – if actual impact of predicative model get too close to boundaries will need to adjust – unable to do till we have flux at end of model. Flux boundaries to be compared between calibrated model and predictive model. 3. Head map for start of predictive transient simulations and head map of calibration start (1910 pre-mining).

Resolution data submittals – 5/4 email with sensitivity runs April

Resolution Presentation – WSP PowerPoint

Plan view will show multiple runs (base case, run in each direction) per image to show differences.

Chris G asked for hydrographs with each sensitivity run added to each.

Q? What was the other recharge run done? Gabi asked for both recharge (zone 3 and 6) to be run. **Is low, low enough for climate change? Jim's request is to ensure change of climate change is covered in sensitivity runs, not necessarily in EIS text.

RCM did a non-log 50% higher/lower on recharge – should cover climate change precipitation.

Temperature from climate change – conductance was not sensitive in model.

Group concern for years used in Jim Ruff's climate documents as it was a "wet period".

EIS will describe best available science trends. Resolution thinks picking the exact # from Jim Ruff's documents is the hard one to decide and ask for it to be qualitative. Keep climate change out of model to keep it consistent with other recent EISs and other resource sections of this EIS.

ADWR models from 2-60 years and they find even 60 years out is hard to determine.

Slideshow -

Side 1- Water Table Impact Drawdown to 5' at end of mine life - ** add 10' contour line to flood **
Model artifacts

Q? what is regional aquifer A: in apache Leap tuft and to west in Paleozoic, Precambrian.

Why is 2/3 different – additional wells dewatering over just 9/10 and the cave will connect both aquifers.

West of Apache Leap only the very deep wells will see impact, the shallow wells in alluvium of Superior will not see the 5' impact.

Slide 2 – 400-year post closure – approx. when all GDEs start to have impacts reverse. – 10' contour, does not feel comfortable with 5' contour out 400 years.

Model was not build with a constant head, Devil's canyon will still have flow in drains, but less head. Chris states: model is built to show impacts not extend past devil's canyon, but that is also what is expected in real life – it matches.

Recharge is steady state – Is that a correct #? Being tested in Sensitivity Runs

Looked at SWCA Springs – limited springs east of Devil’s Canyon Arnett – too high so the eastern line is not as significant

DHRES-16_743 “piezo stack” surrogate to Superior basin, not at depth or alluvium (198’)

DC_9.14 – just under 8’ max, 7’ at LOM and 8’ 200 years out. Major impact at Apache Leap breakthrough

QC – 17.39 – need to verify as it is higher than no action – maybe a gallery well was not turned off in no action case but yes in action case models. Correct way will be to add gallery well in both action/no action model.

DC 8.1 2’, 8.2 3’ drawdown

Model has less detailed geology further away from mine site.

Need to pick a threshold – 1’ in hydrograph – 5’ in color flood. Previously described: unlikely <1, likely 1-10’?

Establish monitoring areas and amounts to implement mitigation. Mitigation will happen, no decision/block cave will happen – disclosure is our goal.

There will be an impact in Devil’s canyon, but not put a finer point on it by putting an exact #.

Where do we draw the line? What are timeframes?

Timeframe – Examples for timing

1. LOM+100 years – assured water supply rules/lifespan of someone born at end of mine – quantified within, qualitatively after that timeframe.
2. Donlin pit lake – 200 years
3. Rosemont pit lake – 200 years
4. USFS Rosemont consult – 150 years

Brett feels 5’ is ok for 200 years, would need 10’ for 1,000 years

Greg wants to show drawdown in DC only and 5’ for the

RCM Moving forward: 10’ contour feels comfortable, hydrographs done for all at 200 years (flip scales for impacts but keep all 3 lines). Excel files thru 1,000 for use to create hydrographs as needed.

Language for describing levels of drawdown.

Govt Panel on Climate Change used the following Extremely likely, more likely than not, more unlikely than likely, extremely unlikely

Yes, no, possible, likely – use a term not tied to statistics – “expected”

Subsidence Lake: 980 years till bottom of subsidence zone. That is lower than any other discharges of model. Equilibrium is “many years” and completely speculative at this point. Water chemistry is also completely speculative at this point. 500 – 1500 years. Does not account for storm flow but does have enhanced recharge as soon as block cave breaks thru surface of rock.

Ecological Risk Assessment – is it too speculative to make those assumptions?

Mary Raz wants a disclaimer of results – 500 to 1500 years based on predictive runs, too speculative this analysis will not be taken further.

Full mixing model would be most conservative, it not realistic, but unable to prove otherwise. Resolution feels it is likely to be normal Apache Leap/White Tail water as that is supplied by runoff and precipitation.

MODFLO-Surfact

Informational discussion – internal discussions occurring for how to document, store, validate models for the project.

Is Modflow Surfact the correct tool to use

- Why did they determine that MODFLOW-SURFACT was the software that needed to be used? What does it do that open-source MODFLOW doesn't do?
 - o Need the time varying feature, mudflow has changed thru time (so far almost a decade) – std mod flow couldn't deal with the upper and lower aquifers but was not originally available in normal mudflow to change material properties & is standard in mining industry. Modflow USG was not originally available (released in 2015-16) and doesn't have the long-term usage as Surfact.
- How and why was MODFLOW-SURFACT modified specifically for this project? (Gustavo already explained this to me by email about a month ago)
 - o Does use an executable (TMP package) which is an add in, but not solely for Resolution when originally used, future releases now have it or it could be bought separately or order the patch version.
- In their opinion, is it possible to model this specific problem without using MODFLOW-SURFACT?
 - o Mod flow 6 (beta now) and will be released soon, originally was not available when project started.
- Yes a person could run USG with patch, model inputs and create another model.

Greg states Nevada DPE thinks Surfact has generated different values without being able to replicate against Modflow. They can't confirm the numerical information within program is bug free.

Provide Nevada document to group.

GDE validation approach

- o Handout for GDE Overview approach – summary of GDE document with conclusion of water source for each GDE.
- o Viewed many inputs to look for the preponderance of evidence.
- o Not fully done, but initial results match Montgomery & Associates results. Will allow for all documentation to be in one spot.

Round Robin – What is going to take to wrap these efforts up (meetings, requested reports/output, and documentation written & reviewed by group)

- o Chris Garrett – We are comfortable with model being done to industry standards, extremely complicated model, always thought we have to be sure not to extend model use too far. We

have received input to draw conclusions the model is valid (presented or to be submitted). Now we need to tie up loose ends and document past 8 meetings, glide path down to 1-2 months.

- Doug Oliver – We are starting sensitivity analysis runs that will take 4 weeks for 80 runs, then write predictive results report and revise/append to October 2017 report with additional calibrations and refinements throughout past meetings.
- Gustavo Mesa- Feels discussion has been good in all angles from how the model is built or used
- Brett Esslin – He is comfortable with everything done so far, would like to see a legend on the flood maps for colors, agree with 10' contours (is not going to argue with 5' but unsure how to justify accuracy). He does not feel you can determine water quality out 1,000 years for a subsidence lake
- Heather Gluski – the group has been great with candor and participation for a defensible model.
- Cameo Flood – Feels good that everyone writing the EIS is understanding how the model is built, uncertainties the team has are accounted for in the record to be clearly resolved/handled, and that EIS authors should be able to defend the model on their own without having to ask Resolution during public meetings.
- Mary Rasmussen – Glad cooperating agencies were involved and able to bring knowledge to their agency. Concern for who is not at the table, want to have a clear defensible model and documentation on what the model can/can't do for the opposition.
- Nick Enos – Feels the solid and rigorous approach taken, our need to document and defend the model, along with the limitations and uncertainties of the model. Want to capture Gabi's place holders for next steps to close this working group.
- Donna Morey – Feel the group has asked many questions to provide a solid model and export that the public can understand.
- Charles Coyle -
- Tim Bayley – Industry standard model that meets the expectation for the model, feels the language written for the applicability and use of the results is paramount.
- Jim Ruff – Appreciate the opportunity to participate with the process. Want to reserve judgement although he feels it likely reasonable, by studying output and Gabi's memo before providing information to his agency folks.
- Greg Olsen – Group with an incredible amount of horsepower, feels we are on the right track for a defensible model. He is glad to see additional information available each meeting.
- Joe Frank – Appreciate working with the group and the working group has been so cooperative. This is a formula of success to this model, group, and EIS.
- Mary Morissette – Nothing to add.
- Chris Pantano – I echo what Doug and Gustavo have already noted. Thank you to everyone who has provided input so we can provide a model that you want.
- Tim Stroope – Echo Greg's sentiment to dig into more details, glad to see participation. Feels the GDE
- Gabi Walser – Still a lot of work to be done and information to be reviewed, feels the process has been good, appreciative to resolution for the requested information being available when asked.
- Jim Butler – Nothing to add.

Schedule

"RCM report" end of July/August after sensitivity runs will take approx. 1 month (70-80 runs)

Some final memo wrap ups could be done by email rather than full meetings.

Next 2 meetings and agenda topics:

June 19, 2017 – update calendar invite (9-3)

Present sensitivity runs

Water balance memo (table submitted 3 weeks early, report 2 weeks early)

Response to Gabi memo data requests

Faults memo

Updated hydrographs (predictive runs)

GDE Results

Language about impacts

July 17, 2017 – should be last in person meeting

Parking Lot

Next steps of memo (no comments received) how to do next round. Can add dissenting opinion, but none stated yet.

Action Items:

1. RCM to submit updated table for water balance 5/18, submit text for updated water balance 5/25
2. Gabi needs to draft a request for WSP output on connectivity values
3. RCM to submit hydrographs to 1,000 & color floods 10' contour for predicative modeling today, text to be submitted late July/August.
4. FS ID Team ask for excel files of all hydrographs to show whatever we want to focus on. With no consensus for timeframe to show.
5. **RCM Moving forward:** 10' contour feels comfortable, hydrographs done for all at 200 years (flip scales for impacts but keep all 3 lines) 2 decks – over 10' one scale, under 10' another scale. Excel files thru 1,000 for use to create hydrographs as needed.
6. **Provide map with insets for Greg on impacts.**
7. SWCA draft description of drawdown impacts by category
8. Provide Nevada document for concern of Surfact to group.
9. SWCA to complete GDE analysis & will present at next meeting. Circulate results at that time if more review is wanted. Process has already been provided to FS and internal team with no feedback.
10. Baseline water quality for Superior Valley and Silver King in late July/August.