

Wellhead Protection Zone Sounding Board

Kick-off Meeting Summary



Time: Wednesday, April 26, 2017 (9:00 a.m. – 12:00 p.m.)
Location: Redmond City Hall, Council Conference Room
15670 NE 85th Street, Redmond, WA 98073

Attendees:

Sounding Board Member	Organization
Joe Skewis	Prototron Circuits
Eric Ferguson	King County DNRP
Connie Sullivan	Puget Sound Keeper
Tom Markl	Nelson Legacy Group
Ken Nabors	Mac & Jacks Brewery
Mike Johnson	Neighborhood representative
Clarke Jewell	Olympian Precast

Others in attendance:

- Amanda Balzer, City of Redmond, Project Manager
- Becky Range, City of Redmond, Communications
- Eric Miller, GeoEngineers, Project Team
- John Porcello, GSI Water Solutions, Project Team
- Sarah Brandt, EnviroIssues, Facilitator
- Liz Mack, EnviroIssues, Facilitation Support

Summary:

Welcome, introductions, and overview

Sarah Brandt and Amanda Balzer welcomed the Sounding Board members and thanked them for their participation. The members introduced themselves. Then, Sarah reviewed the meeting agenda.

Sounding Board process

Sarah walked through the Sounding Board process and the goals for the group. She also reviewed the operating guidelines and confirmed meeting ground rules. A key element Sarah described was an online tool that will be used to share information about this process. All Sounding Board members gave permission for their names to be included on this tool for interested parties to contact.

Group discussion:

- Tom Markl asked how the Sounding Board results group will be reflected in the wellhead delineation. Amanda responded that the team will capture the input from the Sounding Board and use it to inform the delineation. She expects that there will be differing opinions in the group, but hopes to find commonalities that the city can use to when making decisions. The Sounding Board input will help adjust the dials of the model and determine the buffers around the models output.

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- Connie Sullivan asked if the presentation will be available after the meeting. The project team agreed to share these.

Redmond's Wellhead Protection (WHP) Zones and drivers to update

Amanda provided an overview of Redmond's WHP program, which began in 2003. She described the shallow unconfined aquifer that is below Redmond and the hydrology that contributes to the aquifer. The aquifer provides 35-40 percent of Redmond's drinking water, and in most places is considered highly vulnerable.

The Wellhead Protection program works to strike a balance between providing an adequate supply of high-quality drinking water and urban growth. The city has been collecting data on the aquifer since 2006, and they now have about 100 monitoring wells. The aquifer was first modeled in 1995 and technology has greatly improved since then. Now is an opportune time to develop a new model using the past 10 years of information and the advanced technology.

The city wants to develop policy in alignment with community interest and has convened the Sounding Board to help understand the community's risk tolerance. This will help the city to develop three to five runs of the model that can be considered when deciding how to update the WHP zones.

Tom asked Amanda to provide an example of risk tolerance. Amanda explained that the model has dials that directly impact the model output. These include policy dials and model dials. She noted that these will be covered in more detail by the model developers later in the meeting.

Amanda walked through the general schedule for the process and introduced Eric Miller, a consultant who helped develop the model.

WHP Zone modeling and calibration

Eric M. explained that a groundwater model is a computer representation of the natural system. He walked through the steps for creating a model.

- **Identify area to be modeled:** For this model, the team chose a domain (or area modeled) based on the watershed boundaries of the system.
- **Develop the model:** Next, the team had to represent the geology of the subsurface below the groundwater. To do this, they looked at data from over 115 bore holes and 22 cross sections. This information was used to create a three-dimensional representation of the geology of the system. The model covers 75 square miles and is divided into small cubes, each representing an area of around 400 feet by 400 feet. Each cube is assigned data on factors such as hydrologic connectivity (how well water is transmitted through the material) and storativity (how much water the material can hold).

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- **Calibrate the model:** Once the model was created, it had to be calibrated or brought into alignment with actual field data. John Porcello explained this process. To calibrate the model, the team adjusted the hydraulic conductivity both among and within the cubes. They also adjusted the storage coefficient which governs how the water table responds to pumping and recharge. To do the calibration, they used data from the monitoring wells to determine the difference between the modeled and observed data. This difference was evaluated using a wide range of statistics and analysis. John presented these results and showed that after calibration, the model predictions closely align with the observed data.

Group discussion:

- Tom asked if the model included the surface of the groundwater (e.g., the water table) as well as the depth of the aquifer. Eric M. replied that it includes both. The team subdivided the model into multiple layers to capture fine-scale details. They are trying to use the model to understand the shape and slope of the water table as well as how it responds to groundwater pumping and recharge. The model also considers various climate change scenarios.
- Tom asked if the model focuses only on the elevation of the water table or if it also includes flows. John explained that the model also calculates flows which is important information for wellhead delineation. The model also shows the connection between the river and the aquifer. John noted that the model also used data on short-term and long-term fluctuations, including seasonal changes.
- Joe Skewis asked when the data collection started. Amanda explained that the city first started getting robust data in 2006.

The modelers use statistics and peer review to determine when they have obtained calibration. The team wanted this product to be a collaborative effort. Two modelers worked together to develop the tool. Then, the USGS office in Tacoma provided external review and collaborative guidance. Lastly, the city staff reviewed the results using their intimate knowledge of the system. The team is very happy with the results and model accuracy.

Level of service and risk tolerance

During the second Sounding Board meeting, the group will further explore how to “turn the dials” on the model to generate different Wellhead Protection zone delineations. John explained a few of the challenges and complexities that come with turning the model dials. One challenge is the scale. The modelers had to take data from 4- to 24-inch holes and extrapolate it to about 75 square miles. Data availability was another challenge. There are many wells in the city, but much fewer in the other areas that were modeled.

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Amanda explained that there are reasonable ranges in level of service that the city needs to work within, but there is flexibility in how the model is adjusted. The Sounding Board will help determine what level of service the city should set for:

- Pumping rates
- Effective porosity (length of capture zones), and
- Rainfall recharge forecasting (in relation to climate change projections).

There are also policy adjustments that could add buffers to the delineation. These include:

- Temporary construction dewatering,
- Impervious surfaces,
- Stormwater infrastructure, and
- Surface water conveyance.

Dewatering. Amanda noted that in 2011 and 2012, the city started to see a lot of construction and dewatering downtown and began to collect data on dewatering. In 2013, the dewatering projects pumped out more water than all city wells combined. The city also observed impacts to groundwater flow from the dewatering and may need to account for that in the new delineation.

Buffers. The city also needs to consider tributaries into the system and determine if buffers should be included for those systems. For example, contributions from Evans Creek have not been considered in previous delineations.

Preliminary model results. Amanda showed the preliminary model capture results (e.g., initial WHP zone delineation) and noted that these boundaries will likely change based on the Sounding Board's discussions and model adjustments.

Group discussion:

- Mike Johnson asked where the dewatering water was discharged. Amanda answered that it goes into the stormwater system, which feeds mostly into the Sammamish River outside of the aquifer. Tom pointed out that the dewatering is only short term. Amanda agreed that each project is short term (occurring over a range of months), but the city is seeing cumulative impacts from all projects.
- Tom asked if the flow from a tributary, even with protection area buffer, would get into the aquifer. Amanda said the tributary would still flow into the aquifer and clarified that the buffers provide protection and can extend restrictions to additional areas.
- Joe asked if peat was the reason there appeared to be a buffer north of the Sammamish River. John said he thinks this is correct, but there is also a large amount of glacial deposit that sits a little higher than the lake and creates a structural barrier, similar to a sand bar.

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Sounding Board perspectives and suggestions

Sarah asked the group to identify where they fall on a risk tolerance scale, with five being the most conservative and proactive approach to wellhead protection, and one being the least. Sarah noted that this initial rating was to help gauge the group’s initial perspective, but could be adjusted in future meetings. The group was evenly distributed between a rating of 2.5 and 5:

Rating	Sounding Board Initial Rating
5 – Most protective / proactive	One member
4.5	One member
4	One member
3.5	One member
3 – Balance proactive / reaction	Two members
2.5	One member
2	
1.5	
1 – More reactive	

Sarah asked the group what additional information they’d like to receive to feel prepared to adjust the dials of the model.

- Eric F. said he would like to understand how the dials impact the zones. He is especially interested in the policy portion; specifically, how regulations or codes would limit activities in the zones and how that would impact businesses and residents.
- Mike agreed and noted that these regulations may need to be different for existing land use compared to future land use. He would also like to see a sensitivity analysis. For example, if you change the dewatering assumption, does this make the capture zone twice as wide or only slightly different.
- Tom noted that there are two considerations, quantity and quality. He would like to understand the sensitivity of these considerations.
- Clarke added that it would be helpful to know more about the policy changes associated with each risk tolerance level and the implications to residents and businesses.
- Joe explained that it would be helpful to know the city’s long-term plans for growth especially in places like the upper Bear Creek.

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- Tom would like to better understand the effects of bodies of water on the groundwater. He also wondered if regulations could allow dewatering projects to recharge the aquifer.

Policy changes being considered

Amanda explained that there are four main categories of policy change being considered.

- The city is planning to make clarifications, not new requirements, to the critical area analysis.
- They are also looking at adding new requirements to fueling stations.
- Next, the city wants to correct existing misalignment among business types.
- Lastly, they are planning to align the WHP zone definitions with the Department of Health definitions.

The city would like to use the input from the Sounding Board to develop three to five model runs which will show the results of different dial adjustments. These results will help show the sensitivity of the model to each variable, and would include discussion of these policy change options.

Approach to outreach

Sarah explained that the city would like to broaden this conversation to a wider audience and give others a chance to provide input on the process. The team is preparing an online tool that will walk users through this process and include surveys and comment opportunities as appropriate. There is also an opportunity to have community meetings or briefings. The city wants to be transparent with this process. Sarah asked the group for suggestions to reach a broader audience.

- Tom suggested emphasizing notification, letting people know that this process is occurring. He suggested:
 - Using the city's electronic newsletter
 - Posting in the Redmond Reporter
 - Sharing information in OneRedmond's weekly electronic newsletter
- Clarke added that the industrial businesses, especially in Zone 1, could benefit from a face-to-face meeting.
- Joe suggested newsletters to reach residents or utility bill fliers.
- Ken noted that the Eastside Business Journal is a good resource.

Additional comments and discussion

Sarah opened the floor for any final questions or comments.

- Tom noted that the model capture results Amanda showed do not align very well with the current WHP zones and asked why there was such a discrepancy. Amanda explained that part of the discrepancy is due to new data on the aquifer and improved model capabilities. Also, the model capture results do not include buffers, but the current WHP zones do include buffers.

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- Joe asked if Redmond would face a liability issue if they don't adopt the Department of Health standards. Amanda replied that they don't have to be in alignment, but the city intends to bring them into alignment.

Wrap up and next steps

Sarah thanked the group for their participation and noted that the team will make the presentations available after the meeting. The next meeting will be mid- to late-May and the facilitation team will send out a scheduling poll to determine the date.