



Harney Groundwater RAC: Discussion Group Materials Subarea Delineation Discussion Guide

Prepared for: Harney RAC Discussion Group

Prepared by: Harmony Burreight, High Desert Partnership and Bobby Cochran, Oregon Consensus

Last updated: 8/28/2024

Prepared for Discussion Purposes Only

Subarea defined (for the purposes of this discussion): A subarea is a bounded geography, within the larger Harney Basin Groundwater Study Area, whose boundaries are defined to reflect differences in A) groundwater connectivity, B) groundwater uses, C) groundwater levels and trends, D) potential differences in future groundwater management, and/or E) any other combination of reasons for delineating a boundary. Subareas will be used in the model scenarios to set geographic boundaries for proposed reductions, which may differ from one subarea to the next. Subareas can also be used to understand the current conditions within that area relative to other areas as well as relative to a desired end state or goal.

OAR 690-010-0130 defines guidelines for subareas as:

(3) For the purposes of ORS 537.735(1)(a) the exterior boundaries of a critical groundwater area may be reasonably inferred or ascertained:

(a) According to the presence of physical natural boundaries, hydrological conditions, or recharge or discharge areas; or

(b) Administratively by defining an affected area that does not have boundaries defined by natural features.

(c) Additionally, to the extent that sub-areas wholly contained within the designated critical groundwater area must be defined to allow for implementation of corrective control provisions, these sub-area boundaries will also be reasonably inferred or ascertained as in 690-010-0130 (3)(a) or (3)(b).

Guiding Question: How should subareas be determined and delineated to test various scenarios in the model?

Criteria for Consideration

The Oregon Water Resources Department (Department) proposed the following criteria to use in delineating subareas for consideration and offered up additional observations (see the Department's [memo](#) on subareas):

- “A [...] subarea is a portion of the [basin] that shares similar hydrogeologic properties and similar groundwater conditions including groundwater level elevations, seasonal and annual water level trends, and response to natural and human stresses. Subarea boundaries do not represent barriers to groundwater flow – groundwater is hydraulically connected across these boundaries. The intent of [delineating subareas] is to group wells together that similarly impact the local portion of the groundwater reservoir and where reductions in groundwater pumpage, through voluntary or regulatory action, will have a timely, measurable, efficient, and similar groundwater response within that subarea.” Adapted from [2024 Groundwater Level Trends Analysis](#).

- The Department presented the following criteria and additional considerations at RAC Meeting #3 and RAC Meeting #4 (materials available [online](#)).
 - **Hydraulic gradient** - the driving force of groundwater flow; indicates groundwater flow direction (flow paths); indicates location of recharge sources; highlights areas of decline.
 - **Groundwater level trends** - information on seasonal and long-term response to stresses; distinct trends among groups of wells; highlight areas of decline; rate and magnitude of decline (see Appendix A for a summary table of groundwater levels from the [2024 Groundwater Level Trends Analysis](#)).
 - **Subsurface materials** - controls the storage and flow of groundwater; variations in the hydraulic properties of subsurface materials occur widely across the Harney Basin.
- The Department has provided an interactive map explorer to help explore data and boundaries: <https://experience.arcgis.com/experience/2db5f0d5e50142138304801e09b72fb7/>.

In past RAC meetings the group has discussed additional criteria and questions for consideration (the list below may not be exhaustive):

- Uplands and lowlands - should the subareas encompass the uplands and lowlands or just the lowlands?
- Flow paths - what areas are “upstream” and “downstream” of each other?
- Spatial expression of reductions - how will reductions in one subarea extend spatially and what is the potential for those reductions to affect another subareas?
- Definition and identification of “problems” – what “problem” are we trying to solve or avoid?
- Shallow and deep parts of the system – do the shallow and deep systems differ by area and how should this be accounted for?
- Groundwater level “anomalies” – how should groundwater levels that differ significantly across short distances be accounted for?
- Goals and “achieving success” – how could delineation of subareas enable or constrain success?
- Features that may serve as natural or administrative “boundaries” – what features could we use to help us draw lines around subareas (e.g., topography, public land survey system [PLSS])?
- The difference between surface water and groundwater boundaries – groundwater flow paths and surface water drainages may not share the same boundaries.
- Local organization – how do various water users currently organize themselves geographically?
- Groundwater dependent ecosystems – where are key ecosystem features located in the basin?
- Other grouped features - are there other features in the basin that are or should be grouped in a certain way?
- Transfer process – how could subareas affect transfers of water rights?
- Feasibility of voluntary agreements – how will subareas affect the effectiveness and feasibility of voluntary agreements?

Options Previously Discussed

The following options for delineating subareas have been previously discussed in the RAC (see Table 1)

Table 1. Options and considerations for delineating subareas from previous RAC meetings

Options Discussed	Description	Considerations
A. Harney Basin Groundwater Study Area	No subareas are delineated and the Harney Basin is managed as one system.	
B. 15 subareas within the Greater Harney Valley Area of Concern GHVGAC (delineated by OWRD - see Option B below)	Subareas are delineated by the Department based on criteria and to address areas with observed groundwater declines in a timely manner and all fall within the GHVGAC.	
C. Five subareas within the GHVGAC (delineated by OWRD based on RAC feedback - see Option A below)	Fifteen subareas within the GHVGAC are grouped into five subareas in response to a request from RAC members.	
D. Three subareas based on surface water drainages or modified surface water drainages (not mapped)	Subareas would be delineated based on the three major surface water drainages (Silver Creek, Silvies River, Donner Und Blitzen).	
E. Three subareas based on USGS groundwater budget analysis	Subareas are delineated based on the three areas used in the USGS groundwater study report to estimate groundwater budgets.	
F. Delineation by hydrologic unit code (HUC) boundaries	The subareas are delineated based on a modified version of delineated surface drainages (HUC 6 or HUC 8).	
G. Multiple subareas based on groundwater study results and local knowledge (not mapped)	The subareas are delineated through discussion and deliberation based on groundwater study results, criteria provided by the Department, as well as local knowledge (likely iterative).	

Groundwater Level Trends Summary Table

The following table provides a “cheat sheet” of groundwater level trends described in the [OWRD 2024 Groundwater Trends Summary](#). More information on how the summary statistics were generated and things that should be taken into consideration when looking at the data can be found in the [OWRD 2024 Groundwater Trends Summary](#). This table is for discussion purposes only. The groundwater level trends are broken out by the 15 subareas currently delineated by OWRD (Option B below). These 15 subareas are grouped and color-coded for another option (Option B) that was presented to the RAC in February 2024 ([link to memo](#)). The subareas are generally sequenced so that they go from West to North to South and are not prioritized in any way. We encourage you to think about how you would “group” different subareas and why.

Table 2. Summary table of groundwater level trends organized by subareas

Option A Subareas (n=5)	Option B Subareas (n=15)	Option C – How would you group and name subareas?	Min Magnitude (feet)	Max Magnitude (feet)	Average Magnitude (feet)	Median Magnitude (feet)	Min Rate (ft/yr)	Max Rate (ft/yr)	Average Rate (ft/yr)	Median Rate (ft/yr)
West “Sub-Basin”	Upper Silver Creek		-23.1	0.0	-5.4	-3.5	-4.4	-0.1	-0.5	-0.4
West “Sub-Basin”	Harney Lake		-9.3	0.0	-2.9	-2.5	-0.9	-0.1	-0.4	-0.4
Weaver Springs	Weaver Springs		-116.9	0.0	-47.0	-48.6	-10.5	-0.5	-4.7	-4.3
North “Sub-Basin”	Dog Mountain		-31.8	0.0	-15.4	-11.5	-5.5	-0.4	-1.9	-1.6
North “Sub-Basin”	Silvies		-29.3	0.0	-4.9	-2.6	-1.1	0.6	-0.3	-0.3
North “Sub-Basin”	Lawen		-51.7	-0.1	-18.5	-18.3	-7.0	0.4	-2.1	-2.2
North “Sub-Basin”	Poison Creek-Rattlesnake Creek		-45.3	0.0	-10.9	-10.6	-3.0	0.7	-0.9	-0.8
North “Sub-Basin”	Crane-Buchanan		-52.0	0.0	-14.7	-10.3	-3.8	4.9	-1.3	-1.4
North “Sub-Basin”	North Harney		-66.8	-9.1	-35.9	-31.3	-4.0	-0.9	-2.3	-2.2
North “Sub-Basin”	Rock Creek		-69.8	-0.5	-21.5	-19.1	-5.0	-0.6	-3.1	-3.3
North “Sub-Basin”	Crane		-68.8	-1.7	-22.5	-20.1	-4.7	1.3	-1.2	-0.9
North “Sub-Basin”	Windy Point		-26.0	0.0	-13.4	-14.2	-2.2	-0.7	-1.1	-0.9
Malheur Lake	Malheur Lake		-1.0	-0.5	-0.8	-0.8	0.3	0.3	0.3	0.3
South “Sub-Basin”	Upper Blitzen		-10.4	0.0	-1.6	-0.7	-0.2	0.1	0.0	0.1
South “Sub-Basin”	Lower Blitzen-Voltage		-39.8	0.0	-4.9	-2.9	-1.1	0.4	-0.3	-0.3