Groundwater Hydrology of Hood River County

Groundwater occurs beneath the land surface in voids and fractures of consolidated rocks (e.g. basalt) and in the openings between grains in unconsolidated materials (e.g. alluvium). Recharge of groundwater in the Hood River Valley is primarily from precipitation and is estimated to be several inches/yr; however this value is not well defined. Other sources of groundwater recharge are infiltration through streambeds and unlined irrigation canals, and irrigation return flow. The small recharge that deeper aquifers receive is primarily from leakage from overlying and underlying aquifers. The general direction of groundwater movement in the county is from south to north with discharge of groundwater occurring at springs, seepage to streams and rivers, evapotranspiration in cases of a shallow groundwater table, and wells.

Information on the hydrogeology of the Hood River Valley and Cascade Locks area is sparse. In addition, there is little data available on occurrence and availability of groundwater in Hood River Valley and Cascade Locks area. This is in great part due to the lack of wells and associated well logs in the area. Existing hydrogeologic information is limited to a 1966 Ground Water Report document developed by the State of Oregon (Sceva, 1966) and a 1983 Water Resources Investigations Report published by the Unites States Geological Survey (Grady, 1983). The following is a brief description of the hydrogeology of the Hood River Valley and Cascade Locks area that is taken from Sceva (1966) and Grady (1983). The discussion focuses on the hydrogeology of water bearing units that are known to have been tapped by wells.

<u>Hood River Valley</u>

The Hood River Valley is underline by the Columbia River basalt formation with depth to the surface of the basalt ranging from the ground surface to hundreds of feet below ground surface. The Columbia River basalt formation is made up of individual lava flows ranging from tens to hundreds of feet thick. Groundwater in the Columbia River basalt generally occurs in the broken contact zone between individual lava flows. The dense, nonfractured basalt in the middle of the lava flows creates low permeable conditions, creating layers of confined aquifers. Faults that stop or impede horizontal movement in the Columbia River basalts have been identified at a few locations in the Hood River Valley; however there remains uncertainty on their location and extent. Wells in the Hood River Valley that draw from the Columbia River basalts are generally very productive, yielding from 70 to 400 gal/min.

At locations in the Hood River Valley the Columbia River basalt is overlaid by the Troutdale formation. The Troutdale formation is a sedimentary unit made up of sandstone and conglomerate (i.e. individual stones cemented together). The thickness of the Troutdale formation is not well identified throughout the region, but is believed to be no more than a few hundred feet. Little information is reported on the yield of wells tapped into the Troutdale formation, however one well near Odell yielded 125 gal/min.

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Portions of the Troutdale formation, or where not present, the Columbia River basalt are overlaid by Quaternary and Tertiary volcanic rocks (i.e. Cascade Andesites). The rock are essentially individual layers of andesitic lava flows. Groundwater likely occurs in the broken interbeds between flows, similar to the Columbia River basalt formation. Wells in this unit have yields of 0.5 to 88 gal/min.

Quaternary undifferentiated deposits (e.g. glacial and alluvial deposits) are present in the Hood River Valley primarily near rivers and streams and in some glacial deposit dominated areas in the Hood River Valley. The saturated thickness of these deposits range from 30 to 250 ft. Most of these deposits are highly permeable and are capable of yielding from a few to a few hundred gal/min. Also, most of these deposits are hydraulically connected to rivers or streams.

Cascade Locks

The city of Cascade Locks is primarily underlain with Quaternary undifferentiated deposits primarily consisting of alluvial deposits of sand, gravel, and boulders. To the south of town the geology consists of a low permeable sedimentary unit called the Eagle creek formation. The Eagle Creek formation is primarily made up of mudflow materials and volcanic debris and is considered to be an unproductive unit from water extraction standpoint, with one well tapped into this formation only able to yield 4 gal/min. Above the Eagle Creek formation exists a nonuniform mixing of rocks of different types and ages that resulted from large block slides into the gorge. Downward movement of water through the slide block area is impeded once it reaches the Eagle Creek formation and moves north along the interface, discharging from the slide block area as a line of springs.

Groundwater Use in Hood River County

Water use in Hood River County predominately relies on surface water and springs. A relatively small, but significant number of wells exist in Hood River County. Through the year 2008, 450 wells have been registered with the Oregon Water Resources Department (OWRD) in Hood River County. The reported well use of the OWRD registered wells is broken down in Table 1. Domestic is the predominant registered use, making up 82% of the wells. It's likely that some registered wells have been decommissioned and not reported to OWRD or simply have been abandoned. Would like to cross search registered wells with water rights to determine the total quantity of groundwater rights in the county

Besides the City of Cascade Locks, all other incorporated communities in Hood River County rely solely on spring or surface water for their municipal water supply. The City of Cascade Locks has groundwater rights for 3.5 cfs, which is approximately 24 % of the cities total water rights. Cascade Locks currently uses only groundwater to meet their demands.

Table 1. OWRD Registered Well Use Totals

Well Use	Registered Wells

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Community	4
Domestic	371
Industrial	15
Irrigation	17
Thermal	2
Not Stated	41
Total	450

Groundwater Development Potential in Hood River County

There exists potential for significant development of groundwater resources in Hood River County owing to the generally favorable hydrogeology of the area and small number of existing groundwater production wells. Additional hydrogeologic characterization of the county is needed to better define areas of potential groundwater development, however, based on the Sceva (1966) and Grady (1983) reports these areas and formations have been identified:

- Alluvium near Columbia River: In areas near Hood River the alluvium is more than 100 ft thick and highly permeable. A well installed in such alluvium at 70 ft below ground surface is reported in Grady (1983) to yield 350 gal/min.
- Columbia River Basalt: Existing wells in the Hood River valley that tap into this formation yield from 70 to 400 gal/min and may be able to yield greater than 1,000 gal/min if located in extremely permeable zones. The Columbia River Basalt are especially a good options in areas that are not overlain with thick units (e.g. Troutdale formation, Quaternary and Tertiary volcanic rocks). Columbia River Basalts have served as a productive source of groundwater in The Dalles and Mosier areas. However, as has been observed in The Dalles and Mosier areas, the potential for significant groundwater declines exists due to the slow recharge of Columbia River Basalt aquifers in combination with over appropriation and commingling of aquifers stemming from improperly sealed wells.
- Cascade Locks slide block material: The slide block material is believed to have the potential to be highly productive, possibly achieving yields greater than 500 gal/min. However, characterization work indicates that identifying a well site that will intercept a groundwater reservoir in the slide block material is of low probability, but with proper characterization the probability can be increased.

It's likely that other geologic formations and areas can be used for groundwater production, but they may lack sufficient saturated thickness, permeability, or lateral extent to yield large quantities beyond that for a domestic well.

Groundwater Resources Characterization Needs

There are several areas where efforts can be focused to gain a better understanding of groundwater resources and hydrogeologic conditions in Hood River County. They include:

- Review well logs and groundwater elevation data that have been collected since publication of the Grady (1983) report to update the conceptual hydrogeologic

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model of the county (e.g. location and depth of formations, groundwater elevations, hydraulic properties of formations).

- Where significant data gaps exist, work with the state to drill characterization boreholes to identify and log hydrogeologic characteristics.
- Groundwater elevation data is a relatively simple and inexpensive measurement that provides fundamental information about hydrogeologic conditions. There currently exists very little groundwater elevation data for the county. This can be remedied by developing a groundwater monitoring network to monitor long-term trends of groundwater elevation.
- Ground truth wells in the OWRD database (Table 1) to obtain a more accurate representation of wells in the county, their status, and their use.
- Evaluate groundwater recharge rates for the different aquifers to obtain an improved understanding of maximum pumping rates that will sustain baseline groundwater levels.
- Delineate groundwater recharge zones to determine contributing areas.
- Hydrogeologic feasibility of artificial aquifer recharge and aquifers storage and recovery to mitigate surface water quality issues and meet future water storage needs.

References

Grady, S.J. 1983. Ground-Water Resources in the Hood Basin, Oregon. USGS Water-Resources Investigation Report 81-1108.

Sceva, J.E. 1966. A Reconnaissance of the Ground-Water Resources of the Hood River Valley and the Cascade Locks Area, Hood River County, Oregon. State of Oregon Ground Water Report No. 10.

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