Memorandum Report

August 6, 2015

TO: Cristiana Figueroa-Kaminsky
LBA Woods Park Coalition

FROM: Alan Wald, LHg

RE: Proposed Ashton Woods Development
Groundwater concerns

As per your request, I have reviewed the proposed Ashton Woods development and stormwater infiltration plans. This review included the following reports:

- Terra Associates, Inc. Geotechnical Report. Trillium. April, 2007
- Robinson and Noble. Hydrogeologic Assessment for the proposed Ashton Woods plat. April. 2015
- Barghausen, Inc. Preliminary Stormwater Site Plan. Ashton Woods. April, 2015
- Noble and Wallace. Geology and Ground-Water Resources of Thurston County, Washington. WSB 10. 1966
- Associated reports and documents.

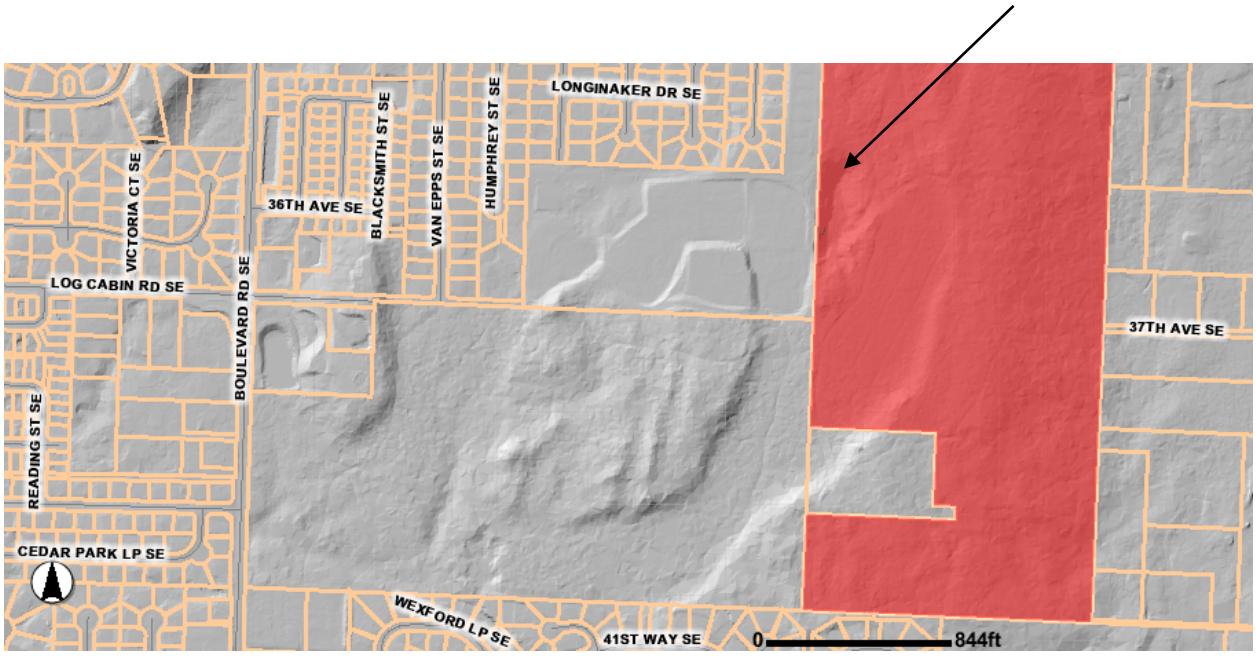
Based on this review, I believe there are several groundwater concerns that should be addressed in greater detail to avoid potential adverse environmental impacts "downstream" or down-gradient of the proposed development.

I. Subsurface Drainage

The proposed project includes discharge of stormwater from 52.4 acres of developed area into an abandoned borrow pit with subsequent infiltration into the underlying aquifer (Barghausen, 2015; Robinson, Noble, 2015).

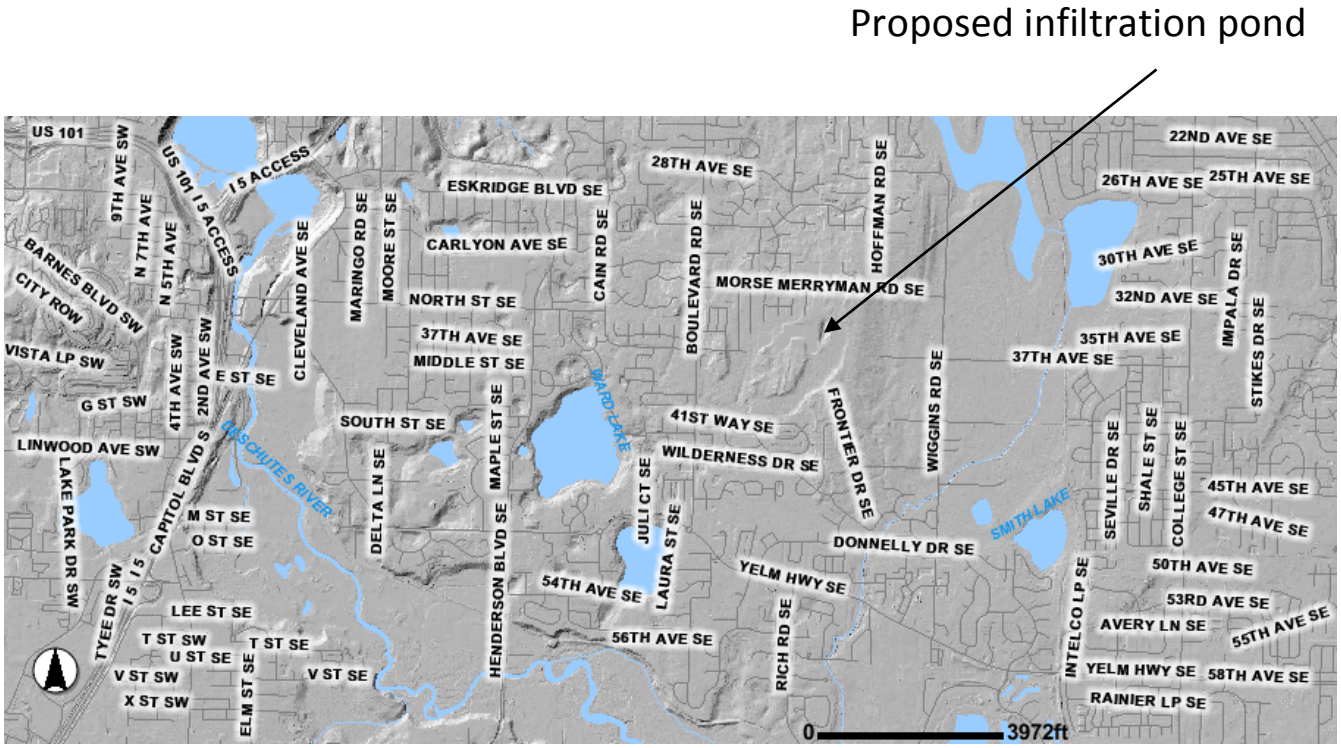
The abandoned borrow pit is shown in the following illustration of subsurface topography based on 2012 LiDAR data published by Thurston County (Thurston County Geodata, 2015):

Proposed infiltration pond



The proposed infiltration pond appears to be located in a relic channel, or paleochannel, of glacial drainage to the southwest through a portion of the Wilderness Development and towards Ward and Hewitt Lakes and the Deschutes River. The area to the southwest of the proposed infiltration pond is shown in a larger context in the following

illustration, also based on LiDAR data from Thurston County (Thurston County Geodata, 2015):



Both Ward Lake and Hewitt Lake are groundwater lakes and their water levels are the level of groundwater in the underlying aquifer.

The relatively constricted subsurface drainage due to this channel feature below the infiltration pit raises a concern for potential groundwater flooding and water quality impacts from stormwater discharge downgradient.

II. Long-term fluctuations in groundwater levels.

Water Supply Bulletin 10 (Noble and Wallace, 1966) includes hydrographs of long-term water level changes in Ward and Hewitt Lakes (and the underlying aquifer) downgradient of the infiltration pit.

Water level changes in the lakes and aquifer range from 8 to 14 feet over a period of 35 years (1930-1965). These water level changes may affect the area available for "mounding" and infiltration of stormwater beneath the proposed infiltration pond.

Hydrogeologic assessment for the proposed project to date has not addressed the impact of rapid stormwater infiltration on the duration, magnitude, and frequency of changes in groundwater levels downgradient, particularly during years of high groundwater levels similar to 1934-1935, or 1950-1951.

III. Water quality impacts from stormwater discharge

The Preliminary Stormwater Site Plan (Barghausen, 2015) includes pretreatment by detention and settling in a retention pond. Retention ponds can provide some settling of particulate matter (total suspended solids) but may not provide sufficient pretreatment for removal of other contaminants, particularly dissolved metals and pesticides.

The proposed stormwater plan includes rapid infiltration directly into the Vashon Advance aquifer (Robinson and Noble, 2015). As noted above, the receiving water is an important regional aquifer open to Ward and Hewitt Lakes and draining into the Deschutes River.

I would suggest environmental analysis of the proposed project should include a thorough review of the all the potential water quality impacts, including heavy metals and pesticides, of infiltrating stormwater

directly into a regional aquifer with significant public and private uses less than a mile downgradient of the point of discharge.