TECHNICAL MEMORANDUM

Review of AKS Report ESRA-PV Mitigation Plan Technical Memorandum

To: Kathy Majidi, City of Gresham

From: Walter Burt, RG, Principal Hydrogeologist, GSI Water Solutions, Inc.

CC: File

Date: September 1, 2023

Introduction

The City of Gresham (City) requested that GSI Water Solutions, Inc. (GSI) review portions of the May 23, 2023 ESRA_PV Mitigation Plan Technical Memorandum for the Veranda development, prepared by AKS Engineering and Forestry (AKS), and provide a professional opinion on shallow groundwater occurrence and flow at the proposed Veranda development site (Site). We understand that a key question is whether seasonal wetlands at the Site may contribute to shallow groundwater flow to Kelley Creek. In this document we provide opinions regarding several key points that AKS makes in its technical memorandum, but first provide a conceptual framework for the groundwater hydrology at the Site to provide some context for observations and conclusions by AKS.

Conceptual Hydrologic Framework

Kelley Creek is a perennial stream, flowing during the entirety of the year (including the dry season). Dry season flow in Kelley Creek is direct evidence of groundwater discharge to the creek from the sediments that blanket the hills of the Gresham Buttes/Pleasant Valley area. Otherwise, the creek would not flow in the dry season months. The source of shallow groundwater that sustains Kelley Creek is recharge from direct precipitation falling on the surrounding slopes, infiltrating into the shallow sediments, and flowing downslope towards the creek. Groundwater will take months to reach the creek in the fine-grained soils native to the area.

During the wet months, infiltration of precipitation recharges shallow groundwater and causes the groundwater table to rise. The shallow groundwater table may rise above ground surface in ditches, and gently-sloped areas at the base of steeper hill slopes, creating seeps and seasonally wet areas. An example of this is Wetland #1, a gently sloped wetland located at the west side of the Site. Slope breaks that host wetlands similar to Wetland #1 provide storage by retaining water in the rainy season and holding it into the late spring, which enhances groundwater recharge in the finer-grained soils in the area by providing more time for infiltration to occur. Where the shallow groundwater surface rises above the base of a ditch, such as that paralleling SE 190th Drive, the ditch will intercept the uppermost portion of the groundwater flow, which is manifested as flow in the ditch.

With the onset of drier weather when evapotranspiration exceeds precipitation, the shallow groundwater surface will start to drop. The recession of the water table in the vicinity of the Site early in the dry season is likely hastened by the draining action of the ditch paralleling SE 190th Drive. As the water table recedes and drops below the ground surface (and bottom of the ditch), seasonal seeps, Wetland #1, and eventually the

ditch dry up. However, groundwater beneath the Site that was recharged during the wet months, including a contribution of water that infiltrated from Wetland #1, continues to flow down towards Kelley Creek even if there is no surface expression at the Site during the dry months. Further, the water that infiltrates into the shallow groundwater system during the wet season likely takes months to reach the creek, which sustains flow in the dry season.

One way to envision the shallow groundwater system that sustains Kelley Creek is as a conveyor belt. The recharge package added in the upper end (uplands) and along the length of the conveyor belt (flow path) during the wet season continues to move downslope towards the creek, and reaches the creek later (i.e., in the dry season), even if not visible in Wetland #1 or drainage ditch paralleling SE 190th Drive. If recharge is reduced, particularly at storage/recharge focal points (e.g., Wetland #1), less water reaches the creek in the dry months.

Comments on AKS Assertions

AKS makes several assertions regarding the connection between Kelley Creek and the wetlands and shallow groundwater at the Site, including:

(1) The majority of shallow groundwater flowing from Site is captured by a ditch adjacent to SE 190th and conveyed to Kelley Creek during winter and spring months and that there is no documented evidence that wetlands provide groundwater discharges to Kelley Creek via the ditch (emphasis mine) during the dry months.
(2) There is no documented evidence of springs providing groundwater discharge from the project site.
(3) There is no objective evidence to support subsurface discharge from wetlands outside the wet season.

In our professional opinion, these statements are misleading and run counter to principles of basic hydrology as summarized in the conceptual framework above. Our response to each of these points is summarized in the order presented:

(1) There is no evidence that infiltration at the Site during the wet season, including in the wetland areas, is captured entirely by the ditch. To the contrary, it is likely that infiltration at the site is not entirely captured by the ditch. The lack of a fragipan layer (low permeability soil horizon) documented by AKS (2023) indicates that there is a pathway for vertical infiltration and flow of recharged groundwater from the surface along flow lines that are not captured by the ditch. The absence of standing water in the wetlands and the ditch paralleling SE 190th Drive only indicate that the groundwater table has dropped below the bottom of the ditch, not that groundwater recharged upslope and beneath the Site has ceased to flow towards the creek during the dry months.
(2) The absence of documented springs discharging to the creek does not indicate that shallow groundwater does not flow from beneath the Site and discharge to Kelley Creek. Discharge to a creek in this setting can occur in many forms. In the case of Kelley Creek and the fine-grained sediments into which it is incised, discharge likely occurs as diffuse flow through the bed of the creek or in seeps along the bank above or below the creek surface. Lee and Snyder (2009) note similar discharge mechanisms to the upper reaches of Johnson Creek.
(3) A lack of water in the wetlands at the Site during the dry season does not mean that the wetlands have not provided recharge to groundwater in the wet season, nor that the groundwater recharge that occurred at the Site does not flow downslope to Kelley Creek. Groundwater will continue to flow downslope during the dry season, and recharge from the wetlands in the winter months will take months to reach the creek, providing critical baseflow in the dry season months.

Other Comments

We also noted two other items in the AKS document that merit comment:

(1) AKS suggests that voluntary enhancement (acres of tree planting) will provide a direct water cooling shade benefit to Kelley Creek.

Comment: The benefit of additional shade along a reach of Kelley Creek would be to reduce thermal loading from direct sunlight during daylight hours and resist additional rise in water temperature. However, shade would not noticeably cool the water as it flows along that reach. In other words, the net effect of added shade will be to help maintain the temperature of the water as it flows along the reach, not actively cool it.

(2) AKS states that the development will not alter the groundwater flow patterns at the Site; however, AKS also states that a bypass line will be installed along the southern site boundary to convey seasonal shallow surface discharge from upslope to an outfall on SE 190th Drive.

Comment: It is unclear whether the bypass line will simply capture surface flow or be installed as a drain that could capture shallow groundwater. Regardless, capturing and piping water entering the site from upslope areas to the south will reduce potential recharge at the site and by definition would alter the groundwater flow patterns at the site. If drains are installed, the bypass line could intercept shallow groundwater flow (if drains are installed) and divert it directly to the creek during the wet season. This would have the effect of increasing winter flows and may reduce discharge during the dry season.

References

AKS Engineering and Forestry, 2023. City of Gresham File Number SD/MIS 20-260000343 (MPLAN 21-00652) ESRA-PV Mitigation Plan Technical Memorandum to City of Gresham Planning Staff, 38 p.

Lee, K.K., and Snyder, D.T., 2009, Hydrology of the Johnson Creek basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2009–5123, 56 p.