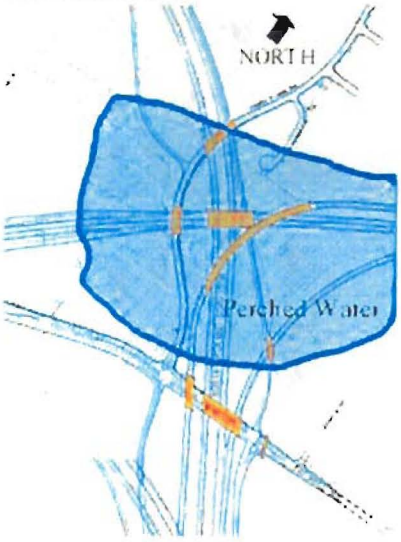
US 2 Profile Change

(Preliminary Subject to Revision)

The original profile configurations of US 2 and the NSC in the vicinity of Shady Slope Road have been revised to accommodate several areas of perched groundwater. Perched groundwater occurs when water in the ground is trapped on top of a semi-permeable or impermeable surface which is higher than the normal groundwater level in the surrounding area.

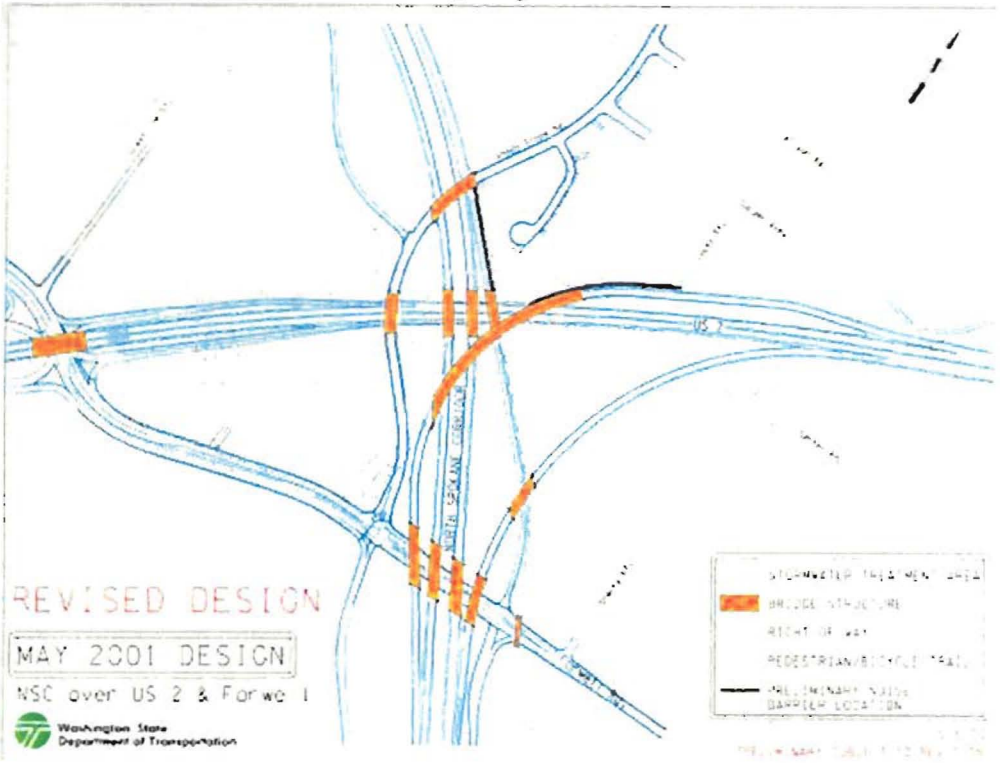
Perched Groundwater



Geotechnical investigations determined that several perched water tables would be affected under the original profile configuration where the NSC was depressed as it passed under US 2. In this situation, water migrating into the depressed freeway section posed a significant drainage problem since the water would collect in the lowered section. To mitigate this problem, the profiles were revised to have the NSC pass over a lowered US 2 roadway. This design will allow groundwater that flows into the lowered US 2 section to flow along the natural drainage course to a water quality treatment pond prior to entering Deadman Creek.

Original Design with the NSC going under US 2

Revised Design with the NSC going over US 2



North Spokane Corridor Project
Groundwater Assessment: Farwell and US 2 Interchange

TO: Chris Winkler/WSDOT

COPIES: Keith Martin/WSDOT
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FROM: Chuck Gruenenfelder

DATE: February 8, 2001

INTRODUCTION

WSDOT project team members working on the North Spokane Corridor Project (NSC) requested CH2M HILL assistance with the review of existing geotechnical and hydrogeologic data collected in the vicinity of the proposed Farwell interchange area. This memorandum summarizes the findings from this review and provides recommendations for additional data collection activities and possible design modifications. The current work has been conducted in accordance with Agreement Y-7395, Task Order AB, Work Order No. OL-3453, dated January 11, 2001.

WSDOT provided CH2M HILL with the following information to facilitate the assessment of shallow groundwater conditions near the Farwell interchange:

1. geotechnical boring logs and piezometer completion diagrams for a series of 19 boreholes/piezometers
2. maps showing the general location of selected piezometers
3. tabulated groundwater level data and borehole details
4. general background information (including plan and profile drawings of the NSC project) and elevation data for several proposed stormwater detention ponds

In addition, CH2M HILL participated in two meetings with WSDOT project team members to (1) review the current database of information and the status of the groundwater monitoring network, (2) discuss the potential impacts and implications of shallow groundwater on the current highway design, (3) discuss the findings from the CH2M HILL data review and analysis task, and (4) identify follow-up data collection activities that address recognized data gaps and further refine the understanding of shallow groundwater conditions in the immediate Farwell interchange area.

Based on recommendations from the first meeting, WSDOT personnel re-developed all piezometers and re-measured static water levels to provide an updated snapshot of shallow groundwater levels within the study area. These revised groundwater elevation data formed the basis for the assessment of shallow groundwater conditions presented herein.

- An approximate east-west cross section just north of US 2 (Sheet 3)
- An approximate east-west cross section just south of Farwell Road (Sheet 4)

These four cross sections are attached to this memorandum, along with two plan view maps (provided by WSDOT) that show the location of the various WSDOT boreholes and piezometers. Perched groundwater was observed in several of the WSDOT piezometers, but does not appear to occur as a laterally continuous zone (or zones) of saturation. Perched groundwater is most continuous in the topographic low area near Farwell Road and US2. In this area, shallow perched groundwater is observed in piezometers PH1-8, DP-13, US2-2, DP-5 and US2EB-1 lying at elevations ranging between about 1810 to 1820 feet above MSL. Despite the variations in the length and position of the piezometer screen zones, the static perched groundwater levels are fairly similar in this localized area. The potential recharge mechanism(s) responsible for the development of this locally continuous perched groundwater zone are not clearly understood. In at least three locations (US2-2, DP-5 and PH1-8) the perched water level has been found to lie above the currently proposed centerline grade.

The highest reported groundwater level (approximately elevation 1822) was observed at FARWSB-1 (see Sheet 4). The absence of observable groundwater in nearby piezometer DP-4 and borehole FARW-1 suggests that perched groundwater at FARWSB-1 may represent a localized zone of saturation that is not hydraulically connected to the more areally extensive perched groundwater zone located further north. An isolated and/or laterally limited perched groundwater zone also was observed north of US2 at piezometer SSSB-2 (see Sheet 3). Perched groundwater levels at FARW-2 (see Sheet 1) and DP-12 (see Sheets 2 and 4), are significantly lower than adjecent piezometers, and may indicate that more than one discrete perched zone is developed within the interbedded sediments of this area.

As shown on Sheets 1 and 2, the existing static perched groundwater level would lie above the proposed grade of the highway in selected areas. The bottom elevation of stormwater detention pond DP-5 also is shown to lie below the static perched groundwater level. This condition suggests that shallow perched groundwater possibly could impact road construction activities, and/or could promote drainage problems if adequate dewatering measures are not incorporated into the existing roadway design. Perched groundwater levels can be expected to rise several feet during the spring wet season, which could further compound the potential for ponded water and drainage problems in topographic low areas along the alignment. Also worth noting is the fact that silty and clayey soil conditions potentially could inhibit stormwater infiltration in selected areas. This condition is most apparent at borehole DP-4 (see Sheet 4) where silty and clayey soils would directly underlie the proposed pond floor bottom (elevation 1821).

CONCLUSIONS

The following conclusions have been developed from the review of the WSDOT soil boring logs, water level data, and other related information:

- Perched groundwater does not appear to be laterally continuous over the entire area addressed by this assessment

record of water level changes during the next 2-3 months. Possible candidates for continuous monitoring include US2-2, PH1-8 and one of the new piezometers east of DP-5.

4. If additional details on the water-bearing capacity and hydraulic properties of the perched groundwater system are required, a short-term pumping test could performed. It is recommended that such a measure be taken only if active dewatering scenarios for groundwater control are being considered.

5. Conduct infiltration tests in selected detention ponds where soil conditions may be conducive to using infiltration as the predominant method of stormwater management.

6. Evaluate options for repositioning the vertical grade of the roadway alignment and associated interchange/stormwater management features to provide greater vertical offset from potential perched groundwater zones.

Bore Hole ID	Mainline Station	Hole Surface El.	Water Table El.	Depth to Water	Depth of Hole	Standing Water
PH1-4-00	42140.06	1907.9			25.9	
PH1-5-00	43415.81	1908.8			30.5	
PH1-6-00	44391.53	1941.7	1855.4	86.4	99.7	26.7
DP-3-00	44799.23	1900.3	1840.5	59.8	60.4	0.6
PH1-7-00	45049.26	1909.2			80.3	
FARWSB-1-00	45397.59	1861.0	1822.2	38.9	42.2	3.4
DP-4-00	45624.72	1856.9			35.2	
FARW-1-00	45698.57	1847.5	1798.0	49.5	55.7	6.1
US2EB-1-00	46445.11	1838.9	1821.7	17.2	21.2	4.0
PH1-8	46571.82	1836.1	1815.2	20.9	37.0	16.1
DP-13	46618.06	1840.6	1809.7	30.9	53.5	22.6
DP-5-00	46668.42	1841.2	1814.7	26.5	59.0	32.5
US2-2-00	46826.88	1838.1	1817.9	20.3	38.4	18.1
SSSB-1-00	47456.57	1843.1			24.9	
PH2-1-00	47710.18	1847.1		no data	40.0	
SSSB-2-00	47794.21	1847.1	1812.1	35.0	42.9	7.9
DP-6-00	48234.29	1835.9	1780.1	55.8	57.2	1.4
PH2-3-00	48717.07	1871.3	1841.0	30.3	31.5	1.2
PH2-4-00	49446.46	1871.3			30.5