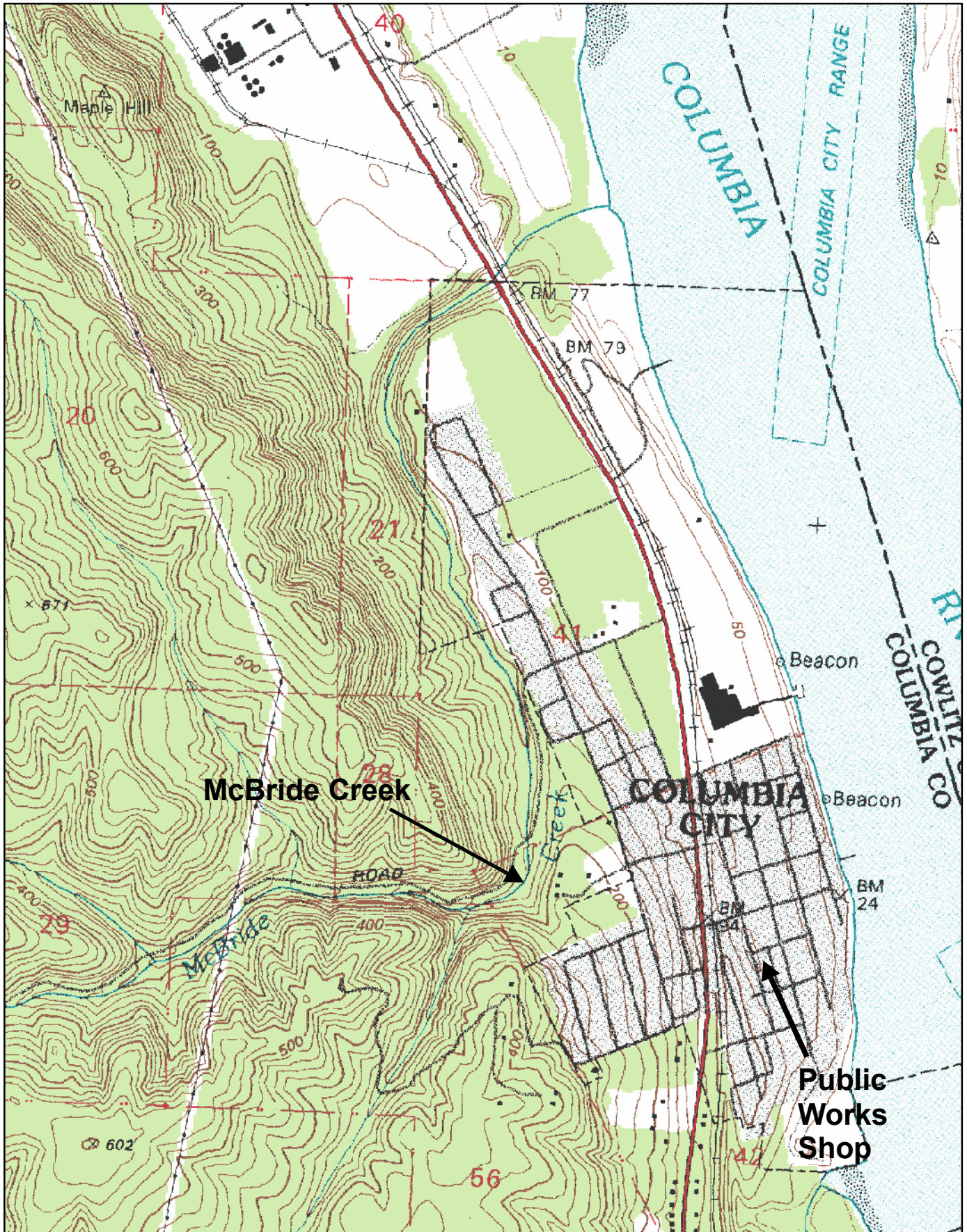


Table 1. Columbia City Inventory Results – List of Potential Contaminant Sources

Ref#	Potential Contaminant Source Type	Associated Land Use	Approximate Location	Proximity to Well	Relative Risk Level	Potential Impacts
1	Public Works Shop	Commercial – Industrial	Near Well	Within 1 year TOT ¹	High	Vehicle maintenance and storage of petroleum products, solvents, and other chemicals may result in impacts to drinking water supply. Fire Marshall inventory at site includes caustic soda (NaOH), toluene, Na and Ca hypochlorite, roundup (glyphosate), amitrole (3-amino-1,2,4-triazole), and crossbow (2,4-D and dichlorophenoxy acetic acid)
2	Sewer Lines	Residential – Municipal	Throughout the DWPA ²	Within 1 year TOT ¹	High	If not properly designed, installed, and maintained, sewer lines can impact drinking water supply, especially within the 2-year TOT ¹
3	Urban Residential	Residential – Municipal	Throughout the DWPA ²	Within 1 year TOT ¹	Moderate	Improper use, storage, and disposal of household, garden and lawn chemicals may impact the drinking water supply. Stormwater run-off or infiltration may carry contaminants to the drinking water supply.
4	Transportation – State Highway, Railroad	Misc	Crossing DWPA	Within 1 year TOT ¹	Moderate	Vehicle and railroad traffic increases the risk for leaks or spills of fuel & other hazardous materials. Road building, maintenance & use can increase erosion/slope failure causing turbidity. Over-application or improper handling of pesticides/fertilizers may impact water.

5	Remnants of burned structure	Misc	Adjacent to northern boundary of DWPA	Within 5 year TOT ¹	Low	Potential source of farm chemicals that had been stored in barn prior to fire.
6	Parking Lot	Commercial Residential	SE of intersection of 2 nd and I Street	Adjacent to 2 year TOT ¹	Moderate	Spills and leaks of automotive fluids in parking lots may impact the drinking water supply.
7	Removed	-	-	-	-	Originally identified as PCS by aerial photography but determined not to be a risk during the field survey.
8	Decommissioned underground storage tanks	Misc	North and northeast of wells	within 1 and 2 year TOT ¹	Low	Historic spills or leaks may impact the drinking water supply.
9	Stormwater Dry Wells	Residential	Throughout the DWPA ²	Within 1 year TOT ¹ and 1 within the 2-5 year TOT ¹	Moderate	Stormwater discharges to dry wells may have included nitrates, solvents, petroleum hydrocarbons, and heavy metals. Contaminants in dry wells have a shorter vertical distance to migrate to groundwater compared to surface releases.
10	Chemical Storage	-	-	-	-	Listed in the Fire Marshall database. Site later determined to be the Public Works Shop (see Site #1).
11	Rural Residential	Residential	Along Miloris Way	Within 5 year TOT ¹	Low	Over-application or improper handling of pesticides or fertilizers may impact drinking water. Excessive irrigation may cause transport of contaminants to groundwater or surface water through runoff.

1. Time of Travel zone 2. Drinking Water Protection Area



Equant

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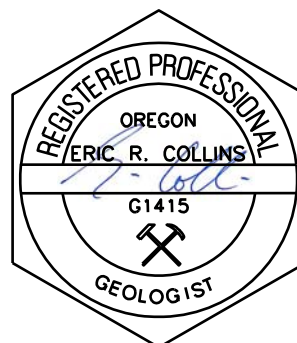
Technical Memorandum

To: Leahnette Rivers – Columbia City

From: Eric Collins, R.G. - Equant
Dennis Nelson, R.G. - GSI

Date: June 20, 2013

Re: Delineation of the Source Water Protection Area
Columbia City, Oregon



Introduction

Equant and GSI Water Solutions, Inc. (GSI) have prepared this technical memorandum to summarize our delineation of the Source Water Protection Area (SWPA) for Columbia City (City) water supply wells located at the Public Works Shop. The delineation of the SWPA establishes the aerial extent of the groundwater source that supplies the City's wells. The results of the SWPA delineation will be used in developing a Source Water Protection Plan for the City.

As discussed in this memorandum, SWPA delineation involved the following steps: 1) review the hydrogeologic conceptual model, 2) select the appropriate delineation methodology, 3) develop the groundwater flow model, and 4) run model simulations to estimate the capture zone generated by the City wells and the SWPA.

Hydrogeologic Conceptual Model

The following hydrogeologic conceptual model is based on the regional geology study by Evarts (2002) and the results from earlier hydrogeologic studies completed by the City (GSI, 2006; 2007; 2011).

Regional Geology

The City is located at the northern end of the Portland Basin, which is a large, northwest-southeast trending, sediment-filled basin in northwestern Oregon and southwestern Washington. The basin is bounded by the Tualatin Mountains on the west and southwest and the Cascade Range on the south and east. The formation of this basin resulted from broad folding and faulting on a northwest-southeast trend and infilling of the basin with younger rocks and sediment.

The oldest rocks underlying the Columbia City area, the Pittsburg Formation (Tsr), are primarily marine sedimentary rocks including sandstone and shale. These marine sedimentary rocks are overlain by the Columbia River Basalt Group (CRBG), which in turn is overlain by sediments mostly related to the Columbia River. The marine sedimentary rocks are thousands of feet thick, poorly exposed in the region, and generally dip toward the southwest. The following figure is a geologic map of the area.

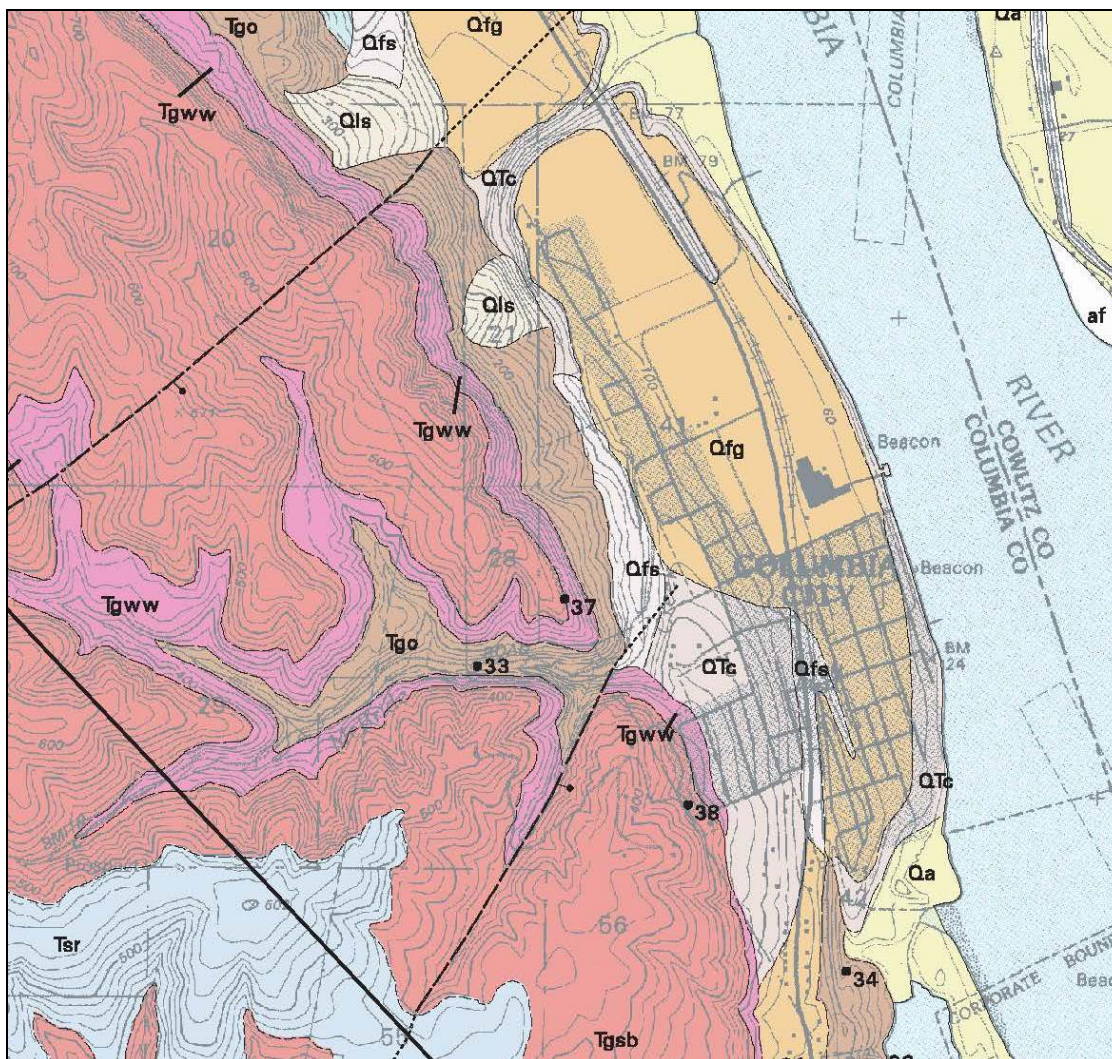


Figure 1: Geologic Map of the Columbia City Area (Evarts, 2002).
See text for unit descriptions.

The CRBG consists of a series of sheet-like basalt flows that erupted from fissures in eastern Washington and Oregon, flowed through the ancestral Columbia River valley, and spread out to cover large portions of northeastern Oregon and parts of northwestern Oregon. The CRBG is hundreds of feet thick in the Columbia City area, and is exposed at the surface in the uplands to the west. Distinct basalt flows in the area include (oldest to youngest) the Ortly Member (Tgo), Winter Water Member (Tgww), and Sentinel Bluffs Member (Tgsb).

The ancestral Columbia River eroded the CRBG and deposited sands and gravels along its channels. Patches of older river deposits (Troutdale Formation) are present in the region but are

generally covered by more recent river deposits. In the Columbia City area, there are three main sedimentary units overlying the CRBG: 1) conglomerate unit related to the Deer Island terrace (QTc), 2) silt and sand sediments deposited from temporarily ponded floodwaters (Qfs), 3) and gravels that form a thin veneer on terrace surfaces (Qfg). The conglomerate unit is approximately 100 feet thick beneath Columbia City and slopes uniformly northward to Dear Island. Located south of Columbia City, a basalt platform projects into the Columbia River. This feature is believed to have preserved the Deer Island terrace deposits during later erosional periods of the Columbia River. Recent alluvium of the Columbia River floodplain (Qa) occupies small areas in the northeast and southeast corners of the City.

Local Hydrogeology

Based on well log information available from the Oregon Water Resources Department (OWRD), wells penetrating basalt in the area encounter stratigraphic characteristics typical of CRBG flows: flow top, dense interior, and flow bottom. The flow tops and flow bottoms (collectively called interflow zones) typically include sediments or fractured basalt and allow for the transmission of water. However, in the vicinity of Columbia City, the CRBG interflow zones do not produce much water. Basalt wells in the area, up to 670 feet deep, typically produce less than 50 gallons per minute (WRD, 2013).

Alluvial sediments, mostly of Pliocene/Pleistocene origin (QTc), overlie the CRBG within the city limits. This alluvium is predominantly semi-consolidated, thick-bedded, conglomerate. A thin layer of clayey silt bounds the bottom of the alluvial unit. The alluvial aquifer is considered to be semi-confined since static water levels in wells penetrating the aquifer are higher than the top of the aquifer.

McBride Creek runs along the west side of the city (Figure 1) but does not appear to be hydraulically connected with the alluvial aquifer since the aquifer is much lower in elevation compared to the creek (refer to GSI's 2007 technical memorandum *Evaluation of Potential Impacts to McBride Creek Related to Development of New Public Works Wells* for additional information (Attached)). The memorandum also includes a geologic cross-section and water level data. Figure 2 is an aerial photograph that shows the locations of water wells in the area relevant to this delineation.



Figure 2: Well locations. PW-1 and PW-2 represent the City's wells. Other wells are described in the text.

In 2003, the City completed a well into basalt in the northwest part of town at Harvard Park (Figure 2). During drilling, no productive zones were encountered in the alluvium overlying the basalt. Well yield from deeper in the basalt aquifer was low and produced water with elevated dissolved solids. The fertilizer plant located north of City owns two inactive water wells (North Well and South Well in Figure 2). In 2004, the City performed pumping tests at the wells to assess the feasibility of incorporating the South Well in its water supply system. Although the South Well appeared to be capable of a sustainable yield of over 500 gpm, subsequent new ownership at the fertilizer plant denied the City use of the wells. The South Well is located on Deer Island terrace penetrating the same alluvial unit mapped beneath Columbia City.

In 2006, the City completed a new well at the Public Works Shop (PW-1). The well is 143 feet deep, penetrates sand and gravel of the Deer Island terrace deposits, and yields approximately 50 gpm (ODHS, 2009a). In 2007, the city completed another well at Public Works (PW-2) approximately 140 feet from PW-1. The well is approximately 148 feet deep, penetrates the same sand and gravel unit as PW-1, and yields approximately 190 gpm (DHS, 2009a). The

difference in well yields is attributed to variability in the formation and aquifer characteristics which is consistent with the braid-plain prograded depositional environmental of the alluvial unit. When the two Public Works wells are operating simultaneously, well yields are reduced due to well interference.

Water level monitoring throughout the year at Public Works indicate water levels ranging from approximately 70 to 75 feet below ground surface. The Public Works wells are located approximately 800 feet from the Columbia River and river stage fluctuations are expected to affect groundwater levels. However, the extent to which the Public Works wells are influenced by river stage has not been quantified. The city of St Helens owns two active ranney collector wells (R2 and R3) and one inactive ranney collector well (R1) located along the shoreline of Columbia City (Figure 2). R2 and R3 yield approximately 1,800 and 2,100 gpm, respectively (ODHS, 2009b). According to the WRD well log database (OWRD, 2013), there are no other wells in the area that draw from the alluvial aquifer.

Recharge to the alluvial aquifer is from natural surface infiltration from precipitation and CRBG interflow zones abutting the west boundary of the alluvial unit. Recharge via the CRBG interflow zones was confirmed by comparing interflow zone elevations, derived from well reports, west of Public Works with the elevation of the alluvial aquifer at the west end (generally from -20 feet to -100 feet).

Several pumping tests have been conducted at the Public Works wells (GSI, 2006). Aquifer parameter estimates calculated from the testing data are discussed in the model input parameter section of this report.

Delineation Methodology

Selection of the delineation method for water systems pursuing SWP is based on the population of the community, complexity of the local hydrogeology, and proximity of pumping wells in the area. Because the local hydrogeology in the Columbia City area is relatively complex and the Public Works wells and St Helens collector wells hydraulically interfere with one another, an analytical groundwater model was selected to delineate the SWPA. WhAEM groundwater flow modeling software (version 3.2.1) is an analytical model that simulates two-dimensional flow for steady-state flow conditions and was used for this delineation (USEPA, 2007). The software is capable of modeling the effects of multiple analytical functions (pumping wells and hydrological boundaries such as rivers and no-flow contacts). WhAEM includes the following simplifying assumptions:

1. Groundwater flow is horizontal.
2. Water is released instantaneously from storage with decline of hydraulic head.
3. The aquifer hydraulic conductivity is isotropic and homogeneous.
4. The base of the aquifer is horizontal and fixed at a given elevation.
5. All wells fully penetrate the aquifer and are 100% efficient.

Model Input Parameters

Each of the model input parameter values are discussed below. All elevation data in the model are based on NGVD29 datum.

Boundary Conditions

As discussed in the conceptual model, terrace deposits underlying Columbia City are recharged from the interflow zones in the basalt formation west of Public Works. The model reflects this recharge as a constant head boundary. Although the groundwater elevation at the boundary has not been measured directly, the constant head boundary elevation was estimated by the following steps: 1) calculate the groundwater gradient between the river and the Public Works wells ($4 \text{ feet} / 830 \text{ feet} = 0.0048 \text{ feet/foot}$), 2) assume that the groundwater gradient between Public Works and the western edge of the alluvial unit is also 0.0048 feet/foot , and 3) estimate the groundwater level at the western edge of the alluvial unit from the extrapolated groundwater gradient (16 feet). This constant head boundary in the model was extended several miles north and south of Columbia City to avoid edge effects in the model results.

The Columbia River was modeled as a constant head boundary set to an elevation of 1 foot based on the USGS Deer Island Quadrangle topographic map. Constant head linesinks were used on each side of the river and extended several miles north and south of the Columbia City to avoid edge effects in the model results. Each linesink for the river was set to a width of 2000 feet, depth of 30 feet, and “resistance” of 1 day (thickness of the resistance layer under the river divided by the vertical conductivity of the resistance layer). The following figure shows the location of the boundaries in the model.

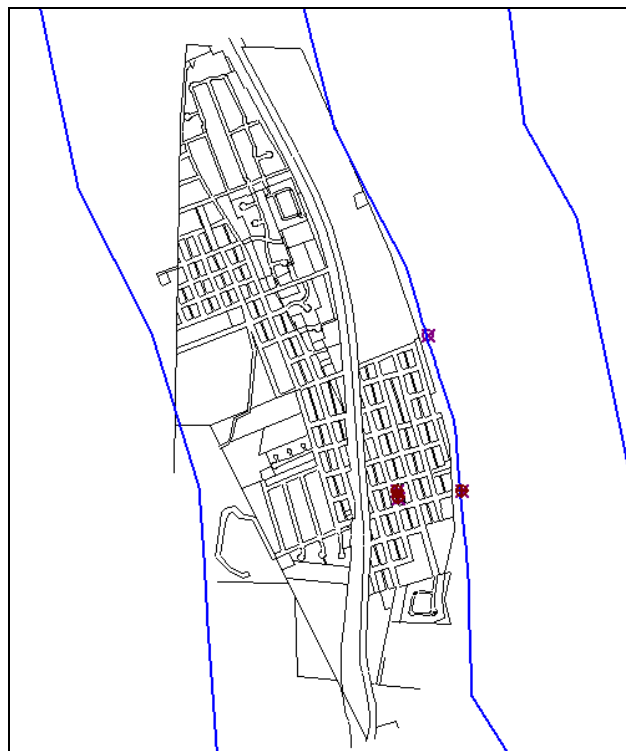


Figure 3: Boundary condition locations used in model. Blue lines denote constant head boundaries.

Hydraulic Conductivity

Aquifer testing was conducted at Public Works during the completion of PW-1 and PW-2. The following table summarizes the results from the testing.

Table 1. Summary of Aquifer Testing at Public Works

Date	Constant Rate Test Duration (hours)	Pumping Well	Estimated Hydraulic Conductivity (feet/day)
Dec-2005	72	PW-0*	98
Jul-2006	62	PW-1	85
Dec-2006	27	PW-2	113

* PW-0 was the original Public Works well. The well was decommissioned in 2007.

Although the testing results indicate some spatial variations in the hydraulic conductivity in the alluvial unit, the aquifer was assumed to be homogeneous in the model which is believed to provide a close enough approximation for the purposes of the delineation. Based on the testing results, the hydraulic conductivity in the model was set to 100 feet/day.

Aquifer Thickness

Based on boring log data available in the area, the saturated zone in the alluvial is 40 feet thick. Therefore, the aquifer thickness in the model was set to 40 feet.

Groundwater Gradient

The observed horizontal groundwater gradient between Public Works and the river is 0.0048 feet/foot. Upgradient from Public Works, no groundwater level data from the alluvial unit were available. However, based on the orientation of the geologic units in the area, it is reasonable to assume that the flow direction and groundwater gradient in the alluvial unit is relatively constant between the river and the recharge boundary at the west edge of the alluvial unit. Therefore, the groundwater gradient and flow direction in the model was set to 0.0048 feet/foot at N85°E.

Porosity

Based on literature values (Todd, 1980) for comparable sediment types encountered in the borings for the Public Works wells (mostly sand and gravel), the porosity was set to 0.35 in the model.

Public Works Wells

The pumping rates for PW-1 and PW-2 in the model were set to 50 and 190 gpm, respectively, based on reported maximum well production capacities (ODHS, 2009a).

St Helens Collector Wells

In order to account for potential interference between Columbia City's wells and the City of St Helens collector wells, the collector wells and pumping wells were modeled simultaneously.

The pumping rates for RW-2 and RW-3 in the model were set to 1,800 and 2,100 gpm, respectively, based on reported well capacity information (ODHS, 2009b).

Modeling aquifer hydraulics at collector wells is relatively complicated compared to modeling aquifer hydraulics at standard water wells (Kelson, 2012). The analytical model for this delineation provides a reasonable approximation for well interference in relation to the Public Works wells. However, a numerical model and additional information regarding river characterization are required to accurately delineate the SWPA for the collector wells.

Model Simulations and Delineations

Drawdown predicted by the model in the Public Works wells was compared to drawdown observed during earlier aquifer testing. Only drawdown data from observation wells were considered in the comparison because of well inefficiency and biased upward drawdown in pumping wells. The following table summarizes the observed and simulated drawdown data.

Table 2. Comparison between Observed and Simulated Drawdown

Date	Pump Test Well	Observation Well	Observed Drawdown (feet)	Simulated Drawdown (feet)	Residual
Jul-2006	PW-1	PW-0	0.5	1	-0.5
Dec-2006	PW-2	PW-0	6.29	6.82	-0.53
Dec-2006	PW-2	PW-1	5.69	5.52	0.17

* PW-0 was the original Public Works well. The well was decommissioned in 2007.

The scaled residual standard deviation of the observed versus simulated head data is 9.8% which indicates that the model is reasonably calibrated and appropriate for delineating the SWPA.

Reverse particle tracking was used in the model to generate flow pathlines. Pathlines that converge into the Public Works wells define the area of capture. The travel-time option in WhAEM allows for delineation of specific time-of-travel zones for each well. The following figures summarize the results from the model simulation.

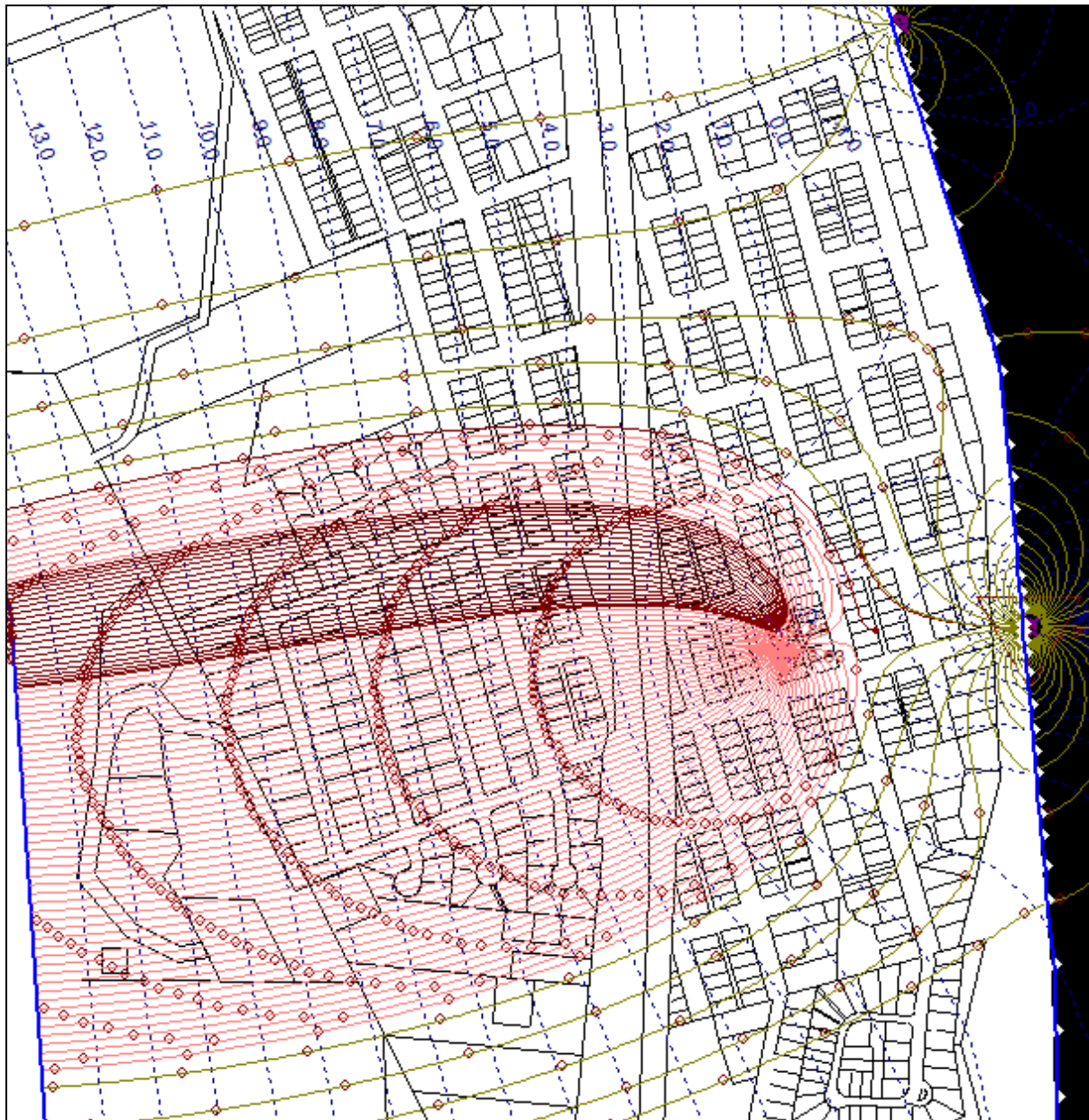


Figure 4: Model simulation showing groundwater elevation contours (blue) and flow pathlines (PW-1 dark red, PW-2 light red, and collector wells light brown). Markings on the pathlines represent one year time of travel. The capture zone for the Public Works wells is denoted by the outermost red pathlines. Time-of-travel zones for the City of St Helens collector wells are also shown (light green) in the figure.



Figure 5 shows the delineated SWPA of the combined wells. The solid red line is the 1 year Time-of-Travel (TOT) zone, the dashed line is the 2 year TOT, and the dotted line is the 5 year TOT.

In Figure 5, the 5 year TOT is truncated at the western boundary of the alluvial aquifer. The delineated SWPA does not extend further west, including the 10 year TOT zone, because of the characteristics of the adjacent basalt unit. The basalt aquifer in this area is considered to have a very low susceptibility to potential surface releases of contamination due to the low permeability of overlying basalt layers. These dense-interior layers are typical of CRBG basalt flows in the region and are evident on local well log descriptions.

Summary

The following is a summary of the Source Water Protection Area delineation.

1. The hydrogeologic conceptual model is based on regional geologic studies and earlier hydrogeologic studies conducted for the City. The results from those studies were used to design the groundwater model.
2. An analytical groundwater flow model was selected for the delineation based on the population of the City and hydrogeologic considerations. The model was calibrated with previous aquifer test data collected at Public Works.
3. Model simulated flow pathlines were used to estimate the capture zone and delineate the SWPA. Although the model simulated flow in the vicinity of the St Helens collector wells, the model does not account for the hydraulic complexities of collector wells. However, the model provides a reasonable estimation of well interference between the City wells and the collector wells for the purposes of the SWPA delineation.
4. The SWPA delineation is based on the model simulations for the 1, 2, and 5 year TOT zones and is presented in Figure 5. The 10 year TOT zone is located over the basalt aquifer, beyond the western extent of the alluvial aquifer. The basalt aquifer is very unlikely to be susceptible to potential surface releases of contamination due to the overlying low-permeable basalt layers.

Attachments

GSI. 2007. *Technical Memorandum - Evaluation of Potential Impacts to McBride Creek Related to Development of New Public Works Wells*. GSI Water Solutions, Inc. November 16, 2007.

References

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- USEPA. 2007. Wellhead Analytical Element Model (WhAEM), version 3.2.1 by the US Environmental Protection Agency. January 1, 2007. <http://www.epa.gov/athens/software/whaem/>



Technical Memorandum

To: Leahnette Rivers – Columbia City

From: Eric Collins, R.G - GSI

CC: Matt Hickey, P.E. – Murray Smith & Associates

Date: November 16, 2007

Re: Evaluation of Potential Impacts to McBride Creek Related to Development of New Public Works Wells



GSI Water Solutions, Inc., (GSI) has evaluated potential impacts to McBride Creek that could result from pumping the new Public Works water supply wells (COLU 53313 and COLU 53400) serving the City of Columbia City. The wells are located approximately one-half mile from McBride Creek. Figure 1 is a topographic map showing the location of the wells and McBride Creek. The purpose of the evaluation is to provide supporting information to the groundwater permit application for review by the Oregon Water Resources Department (OWRD). The evaluation was based on a literature review of the regional geology/hydrogeology, well log data, and the results from aquifer testing conducted in the Public Works area.

Project Background

The City has completed three wells on the parcel of property occupied by the City's Public Works shop located at 1840 Second Street. The wells are located within a 75-foot radius of one another. This section provides a brief summary of the well

constructions, well yields, and administrative status. Well logs for each well are provided in Attachment A.

Original Well (PW0, COLU 1211)

This well was completed in 1939 to a depth of 158 feet below ground surface (bgs). Based on video log information, the casing is perforated from 100 to 133 feet bgs. The well is uncased from 133 to 139 feet. Although the well is capable of yielding approximately 300 gallons per minute (gpm), the well seal and the well's proximity to a nearby sanitary sewer line are not in compliance with State regulations. A groundwater registration to appropriate up to 100 gpm is appurtenant to the well (GR 2515). The City is planning to add the new Public Works wells (PW1 and PW2) to GR 2515 as additional points of appropriation through the groundwater registration modification process.

Public Works Well No. 1 (PW1, COLU 53313)

This well was completed in September 2006 to a depth of 143 feet bgs. The well is screened from 107.5 feet to 138 feet and is surrounded by sand pack. The well penetrates the same aquifer as PW0. Although extensive well development was conducted, well yield was less than 50 gpm which does not meet the City's target flow rate of 300 gpm. Based on aquifer testing data, the low yield appears to be related to a zone of low hydraulic conductivity near the well. Subsequently, the City decided to complete another well at the Public Works site to meet their target flow rate.

Public Works Well No. 2 (PW2, COLU 53400)

This well was completed in March 2007 to a depth of 150 feet bgs. The well is screened from 116 feet to 134 feet and is surrounded by natural pack. The well penetrates the same aquifer as PW0 and PW1. Aquifer testing indicates that the well may be capable of producing an average of 500 gpm.

Regional Geology

GSI reviewed several studies on the geology and hydrogeology of the region including work by Evarts (2002) and Swanson et al. (1993). The City is located at the northern end of the Portland Basin, which is a large, northwest-southeast trending, sediment-filled basin in northwestern Oregon and southwestern Washington. The basin is bounded by the Tualatin Mountains and the Cascade Range. The formation of this basin resulted from broad folding and faulting and infilling of the basin with younger rocks and sediment.

The oldest rocks underlying the Columbia City area, the Pittsburg Formation, are primarily marine sedimentary rocks including sandstone and shale. These marine sedimentary rocks are overlain by the Columbia River Basalt Group (CRBG), which

in turn is overlain by sediments mostly related to the Columbia River. Figure 2 is a geologic map of the area (Evarts, 2002). The marine sedimentary rocks are thousands of feet thick, poorly exposed in the region, and generally dip toward the southwest.

The CRBG consists of a series of sheet-like basalt flows that erupted from fissures in eastern Washington and Oregon, flowed through the ancestral Columbia River valley, and spread out to cover large portions of northeastern Oregon and parts of northwestern Oregon. The CRBG is hundreds of feet thick in the Columbia City area, and outcrop in the uplands to the west. Distinct basalt flows in the area include (oldest to youngest) the Ortly Member, Winter Water Member, and Sentinel Bluffs Member.

The ancestral Columbia River eroded the CRBG and deposited sands and gravels along its channels. Patches of older river deposits (Troutdale Formation) are present in the region but are generally covered by more recent river deposits. In the Columbia City area, sediments overlying the CRBG include three mapped units: 1) conglomerate unit related to the Dear Island terrace, 2) silt and sand facies deposited from temporary ponded floodwaters, 3) and gravel facies that form a thin veneer on terrace surfaces. The conglomerate unit is approximately 100 feet thick beneath Columbia City and slopes uniformly northward to Dear Island. Located south of Columbia City, a basalt platform projects into the Columbia River. This feature is believed to have preserved the Dear Island terrace deposits during later erosional periods of the Columbia River.

A normal fault dipping to the southeast has been mapped west of Columbia City (Figure 2). Curiously, McBride Creek dramatically changes direction to the north near the fault and again further downstream near another mapped fault. It is possible that the current path of McBride Creek was influenced by historic displacements of bedrock associated with local faulting.

Local Geology/Hydrogeology

Information from well logs in the area was reviewed as part of assessing the local geology. Available well logs in the vicinity of Public Works are provided in Attachment A. The deepest well completed near Public Works is the Iverson well (COLU 50672) at 670 feet bgs penetrating the CRBG. This well was completed in the uplands above the alluvial deposits associated with the Columbia River. The well log indicates massive basalt with two claystone intervals presumably representing interflow sedimentary horizons or weathered vesicular flow tops of the CRBG.

Beneath Public Works, alluvium overlies the CRBG and is predominantly thick-bedded, sand and gravel deposits to a depth of approximately 150 feet bgs. A gravelly silt zone was identified from 81 feet to 87 feet bgs. In addition, a thin layer

of clayey silt bounds the bottom of the alluvial unit. A geologic cross-section was prepared to illustrate our conceptual understanding of the geology in the Public Works area. Figure 2 includes the location of the section and Figure 3 is the cross-section.

Water level data from well logs were also used to assess the potential hydraulic connection between the aquifer supplying the Public Works wells and McBride Creek. Each well log includes the depth at which water was first encountered and the static water level. The depth to the top of the aquifer at each well location is inferred from the depth at which water was first encountered. The following table summarizes the water level data.

Well ID	Owner/ Location	Surface Elev.	First Water		Static Water		Comments
			Depth (feet)	Elev. (feet)	Depth (feet)	Elev. (feet)	
1211	Columbia City Public Works PW0	75	102	-27	75	0	
44948	Jones	180	200	-20	90	90	Basalt unit 110 feet deep. No measurable yield in alluvium.
50672	Iverson	400	458	-58	260	130	Located in uplands west of McBride Creek
50807	Columbia City 6 th Street/Penn Street	120	>162	<-42	-	-	Basalt unit 153 feet deep. Dry boring to total depth of 162'
50933	St. Helens Ranney #3	25	18	7	18	7	
52054	Columbia City 9 th Street/K Street	280	310	-30	220	60	Basalt unit 29 feet deep. No measurable yield in alluvium.
52201	Columbia City Harvard Park	120	315	-195	104	16	Basalt unit 149 feet deep. No measurable yield in alluvium.
53313	Columbia City Public Works PW1	75	87	-12	68	7	
53400	Columbia City Public Works PW2	75	83	-8	71	4	

Note: All depths in feet below ground surface (bgs) and elevations in feet Mean Sea Level (MSL)
All wells location in Columbia County (COLU)

As shown on the table, higher static water levels in relation to the top of the aquifer are apparent in all wells except the ranney well indicating confined aquifer conditions. The aquifer in the McBride Creek area occupies the CRBG unit but not the alluvial unit. Closer to the Columbia River near Public Works, the aquifer intersects the alluvial unit and continues to be confined. Figure 3, geologic cross-section, includes water level data in relation to McBride Creek. As shown on the Figure, the elevation of the top of the aquifer near McBride Creek is approximately -

20 feet mean sea level (MSL). The elevation of McBride Creek along the section is approximately 120 feet MSL which is considerably higher than the aquifer. As shown on the table above, water level data collected from wells located off-section (COLU 50807, COLU 52054, and COLU 52210) further demonstrate that McBride Creek is higher than the aquifer.

Conclusions

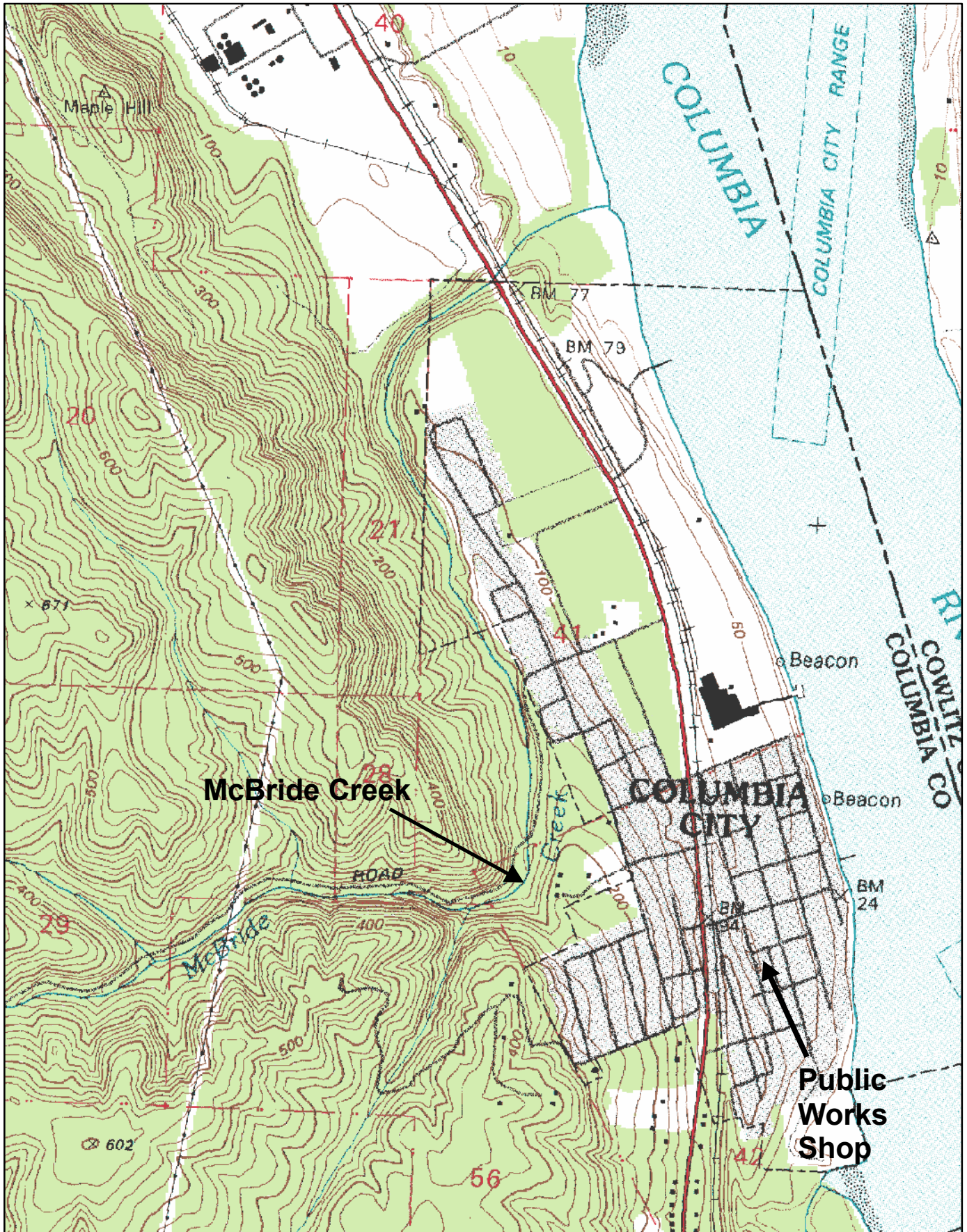
Well log data indicates that the alluvial aquifer supplying the Public Works wells is confined consistent with the definition in OAR 690-009-0020(1). Our assessment indicates that McBride Creek is located considerably higher than the aquifer and is therefore, not hydraulically connected as defined in OAR 690-009-0020(6). On the basis that there is no hydraulic connection (690-009-0040(6)), pumping from the Public Works wells are assumed to not interfere with McBride Creek.

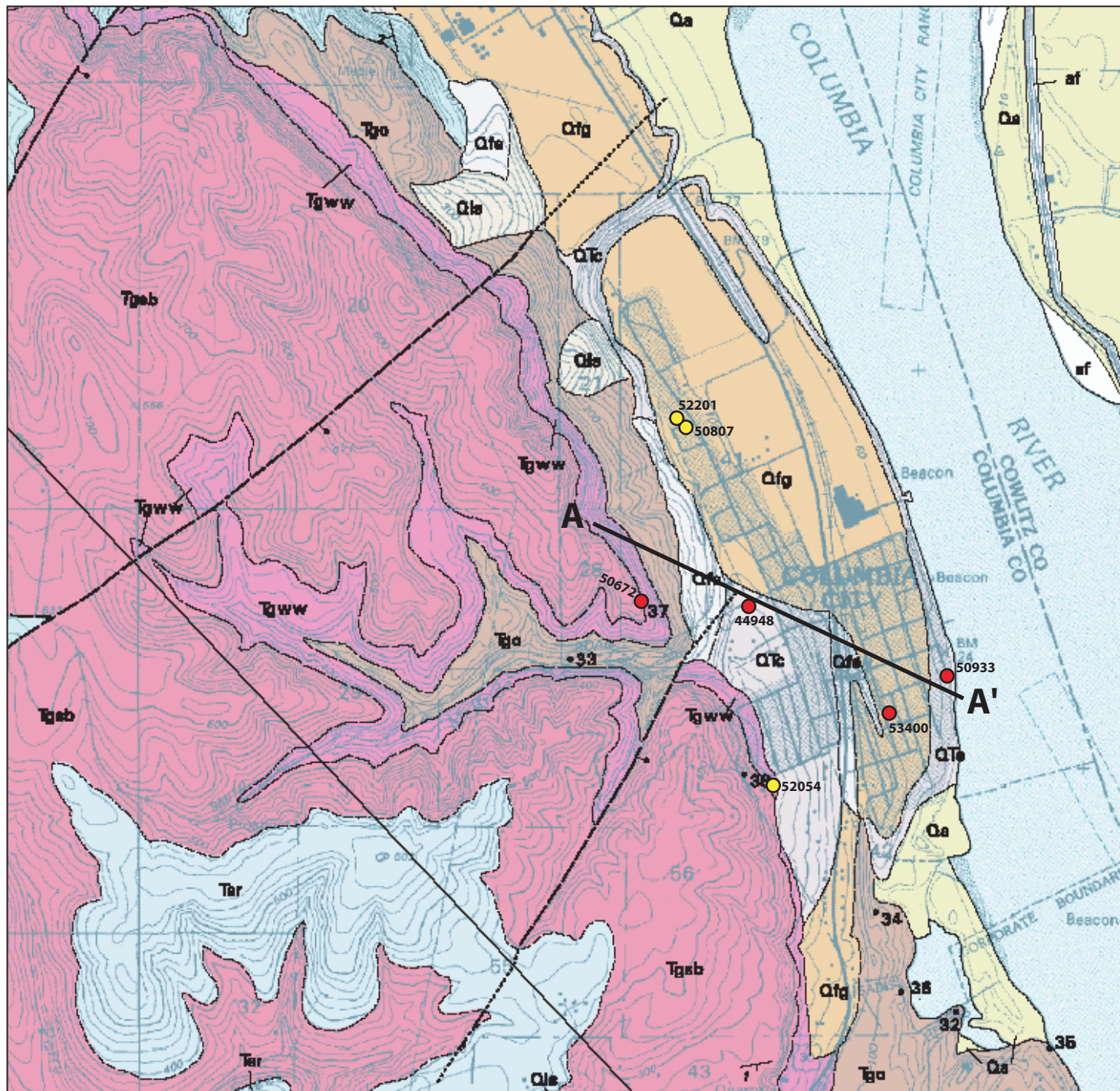
References

- Evarts, R.C., 2002. A Geologic map of the Deer Island quadrangle, Columbia County, Oregon and Cowlitz County, Washington. U.S. Geological Survey, Miscellaneous Field Studies Map MF-2392.
- Swanson, R.D., W.D. McFarland, J.G. Fonthier, and J.M. Wilkinson. 1993. A Description of Hydrogeologic Units in the Portland Basin, Oregon and Washington. U.S. Geological Survey, Water-Resources Investigations Report 90-4196.

Attachments:

Figure 1	Site Vicinity Map
Figure 2	Geologic Map and Cross-Section Location
Figure 3	Geologic Cross-Section
Attachment A	Well Logs





Legend



0 0.25 0.5

Miles

A A'

Location of
Cross-section

- Well (WRD Well ID)
- Wells used for cross-section

From: USGS Geologic Map of the Deer Island Quadrangle, Columbia County, Oregon and Cowlitz County, Washington. By Russell C. Everts, 2002.

Map date: 11/6/2007
Created by: R. Cook



Figure 2

Columbia City Cross Section

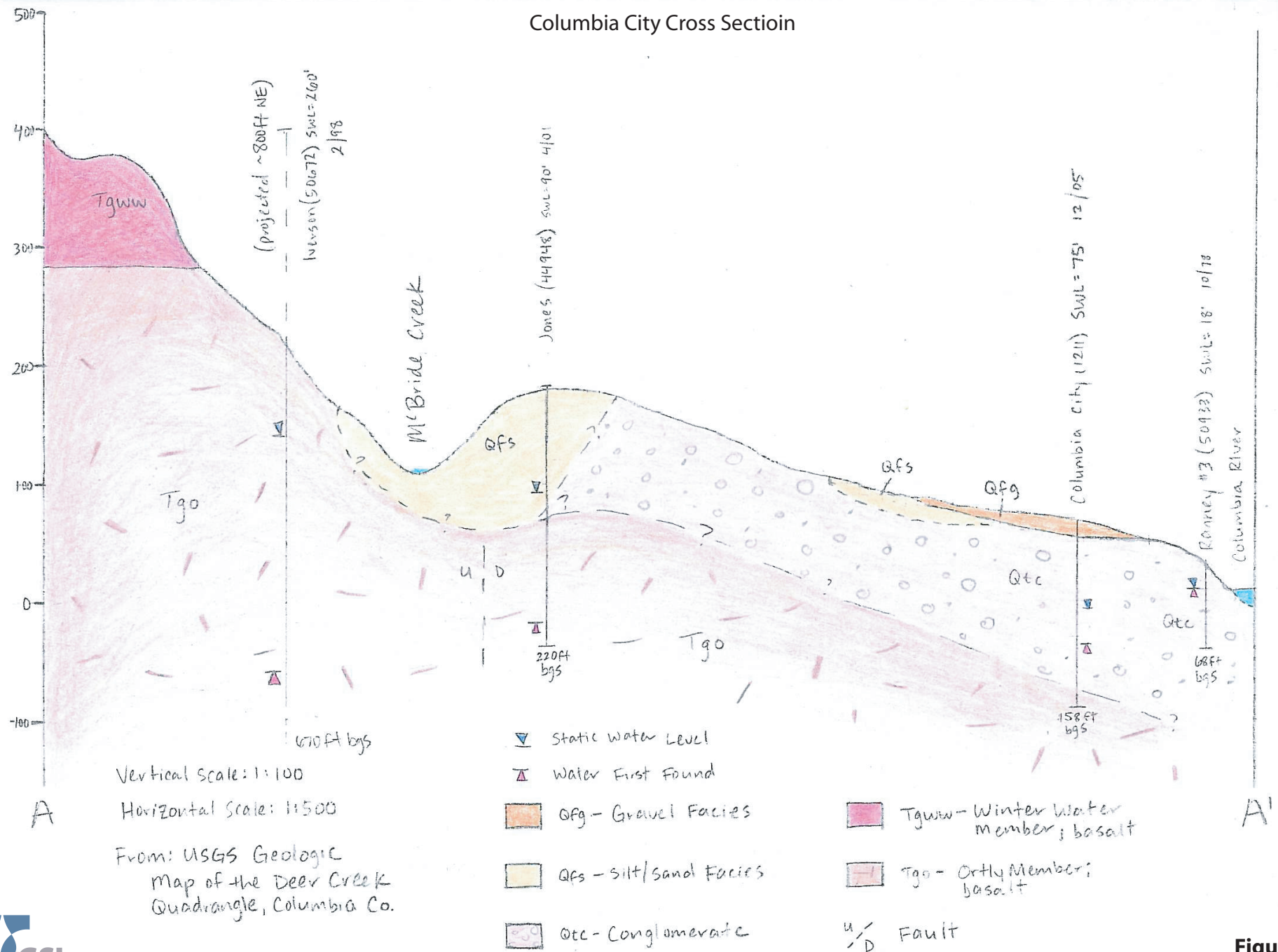


Figure 3
Geologic Cross Section

Appendix A

Well Logs

STATE ENGINEER
Salem, Oregon

Well Record

STATE WELL NO. 5N/1W-28H
COUNTY COLUMBIA
APPLICATION NO. GR-2515

OWNER: City of Columbia City

MAILING
ADDRESS:

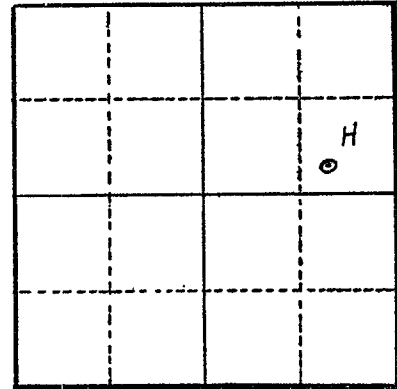
LOCATION OF WELL: Owner's No.

CITY AND
STATE:

Columbia City

SE 1/4 NE 1/4 Sec. 28 T. 5 N. R. 1 W., W.M.

Bearing and distance from section or subdivision
corner 1500' E & 380' S from center of Sec 28



Altitude at well

TYPE OF WELL: Drilled Date Constructed 1939

Depth drilled 158' Depth cased

Section 28

CASING RECORD:

8-inch to 134' (telecom with Ed Jansen 2/11/75, F.G.L.)

FINISH:

Perforated casings (Unknown Interval)

AQUIFERS:

WATER LEVEL: First water at 102 - Small amount (per telecom with Ed Jansen 2/11/75, F.G.L.)
SWL 100'

PUMPING EQUIPMENT: Type Deming. 6 in. cup pump H.P. 15
Capacity 120 G.P.M.

WELL TESTS:

Drawdown ft. after hours 120 G.P.M.
Drawdown ft. after hours G.P.M.

USE OF WATER Municipal Temp. °F. 19

SOURCE OF INFORMATION GR-3873

DRILLER or DIGGER A. M. Jansen

ADDITIONAL DATA:

Log NA Water Level Measurements Chemical Analysis Aquifer Test

REMARKS: Log: 0 - 122 gravel
122 - 138 Boulders
138 - 140 Clay
140 - 148 Rock
148 - 155 Blue sandstone
} Per telecom with Ed Jansen 2/11/75, F.G.L.

(as required by 28 CFR 537.765)

Instructions for completing this report are on the last page of this form.

(START CARD) # **126471**

Signed Art Mink WWC Number 1480
Date 9 APRIL 01

RECEIVED

Colu 50672 DEC 15 1999 Amendment

STATE OF OREGON WATER SUPPLY WELL REPORT (as required by ORS 537.765)

WATER RESOURCES DEPT.
SALEM, OREGON

Amended see #9
WELL I.D. # L 110031
START CARD # 1036666

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number _____
Name Chris Iverson
Address 495 S 7th
City St Helens State OR Zip 97051

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other _____

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 360 ft.
Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE SEAL
Diameter From To Material From To Seal or pounds
10 0 98 Concrete 0 98 79
6 98 670 Gravel _____

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:
Diameter From To Gauge Steel Plastic Welded Threaded
Casing: 6" 0 98 150 ☒ ☐ ☒ ☐
Liner: 4 416 560 160 ☐ ☒ ☐ ☐
Final location of shoe(s) 98'

(7) PERFORATIONS/SCREENS:
☒ Perforations Method Saw Cut
☐ Screens Type _____ Material _____
From To Slot Number Diameter Casing Liner
486 506 5" 13 .250 4 ☐ ☒
506 536 5" 13 .250 4 ☐ ☒
516 546 5" 13 .250 4 ☐ ☒

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailor ☒ Air ☐ Flowing
Yield gal/min _____ Drawdown _____ Drill stem at _____ Time _____
Temperature of water 57 Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County Columbia Latitude _____ Longitude _____
Township 5 N or S Range 1 E or W
Section 28 N.E. 1/4 N.W. 1/4
Tax Lot 00803 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 36360 Smith Rd St Helens OR 97051

(10) STATIC WATER LEVEL:
360 ft. below land surface. Date 1-5-98
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:

Depth at which water was first found 458

From	To	Estimated Flow Rate	SWL
<u>458</u>	<u>460</u>	<u>3.5</u>	<u>360</u>
<u>690</u>	<u>650</u>	<u>36.5</u>	<u>360</u>

(12) WELL LOG:

Ground Elevation _____

Material	From	To	SWL
<u>Brown silt</u>	<u>0</u>	<u>4</u>	
<u>Red clay</u>	<u>4</u>	<u>24</u>	
<u>Tan clay</u>	<u>24</u>	<u>55</u>	
<u>Multicolored Basalt</u>	<u>55</u>	<u>90</u>	
<u>Clay Basalt</u>	<u>90</u>	<u>115</u>	
<u>Brown Basalt</u>	<u>115</u>	<u>133</u>	
<u>Same but Broken</u>	<u>133</u>	<u>140</u>	
<u>Clay Basalt</u>	<u>140</u>	<u>205</u>	
<u>Tan Clay Stone</u>	<u>205</u>	<u>215</u>	
<u>Clay Basalt</u>	<u>215</u>	<u>385</u>	
<u>Black Basalt</u>	<u>385</u>	<u>458</u>	
<u>Clay Basalt</u>	<u>458</u>	<u>539</u>	<u>360</u>
<u>Black Wood Brown Clay</u>	<u>539</u>	<u>587</u>	
<u>Multicolored Basalt</u>	<u>587</u>	<u>589</u>	
<u>Black Basalt</u>	<u>589</u>	<u>630</u>	
<u>Clay Broken Shale</u>	<u>630</u>	<u>660</u>	<u>360</u>
<u>Clay Shale</u>	<u>660</u>	<u>670</u>	

Date started 1-24-98 Completed 2-5-98
(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
TURNER WELL DRILLING
Signed _____ WWC Number _____
SCAPPOOSE, OR 97056
(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
Signed _____ WWC Number 1679 Date 1-18-98

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number _____
Name Chris Iverson
Address 495 S 7th
City St Helens State OR Zip 97051

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 56' 6"
Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE				SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds	
10	0	98	Cement & Bentonite	0	98	89	
6	98	670					

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other

Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing: 6"	0	98	12	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Liner: 4	98	560	16	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) 98'

(7) PERFORATIONS/SCREENS:
☒ Perforations Method Saw Cut
☐ Screens Type _____ Material _____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
486	506	5"	12	2.50	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
506	526	5"	13	2.50	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
526	246	5"	13	2.50	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>

(8) WELL TESTS: Minimum testing time is 1 hour

Pump	Bailer	Air	Flowing
Yield gal/min	Drawdown	Drill stem at	Artesian Time
40		480	1 hr.

Temperature of water 57 Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

RECEIVED

FEB 20 1998

WATER RESOURCES DEPARTMENT
SALEM, OREGON

WELL I.D. # L 20031
START CARD # 1036666

(9) LOCATION OF WELL by legal description:

County Columbia Latitude _____ Longitude _____
Township 5 ☒ N or S Range 1 E or ☒ WM.
Section 28 N.E. 1/4 N.W. 1/4
Tax Lot 00803 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 36360 Pittsburg Rd St Helens, OR 97051

(10) STATIC WATER LEVEL:

260 ft. below land surface. Date 2-5-98
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:

Depth at which water was first found 458

From	To	Estimated Flow Rate	SWL
458	462	3.5	260
620	650	36.5	260

(12) WELL LOG:

Ground Elevation _____

Material	From	To	SWL
Brown silt	0	4	
Red clay	4	24	
Tan clay	24	55	
Multicolored Basalt	55	90	
Gray Basalt	90	115	
Brown Basalt	115	133	
Same but broken	133	140	
Gray Basalt	140	205	
Tan Clay Stone	205	215	
Gray Basalt	215	383	
Black Basalt	383	458	
Gray Basalt	458	539	260
Black Wood Brown clay	539	587	
Multicolored Basalt	587	589	
Black Basalt	589	620	
Gray Broken Shale	620	650	260
Gray Shale	650	670	

Date started 1-24-98 Completed 2-5-98

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number _____

Signed _____

Date _____

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1679

Signed Tom C. Amerson

Date 2-18-98

RECEIVED

Colu 50672 DEC 15 1999 Amendment

STATE OF OREGON WATER SUPPLY WELL REPORT (as required by ORS 537.765)

WATER RESOURCES DEPT.
SALEM, OREGON

Amended see #9
WELL I.D. # L 110031
START CARD # 1036666

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number _____
Name Chris Iverson
Address 495 S 7th
City St Helens State OR Zip 97051

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other _____

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 360 ft.
Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE			SEAL		
Diameter	From	To	Material	From	To
10	0	98	Concrete	0	98
6	98	670	Gravel		

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing: 6"	0	98	150	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Liner: 4"	98	670	160	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) 98'

(7) PERFORATIONS/SCREENS:

From	To	Slot size	Number	Diameter	Material	Casing	Liner
486	506	5"	13	.250	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
506	536	5"	13	.250	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
536	546	5"	13	.250	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>

(8) WELL TESTS: Minimum testing time is 1 hour

<input type="checkbox"/> Pump	<input type="checkbox"/> Bailor	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Flowing
Yield gal/min	Drawdown	Drill stem at	Time
40		480	1 hr.

Temperature of water 57 Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County Columbia Latitude _____ Longitude _____
Township 5 N or S Range 1 E or W
Section 28 N.E. 1/4 N.W. 1/4
Tax Lot 00803 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 36360 Smith Rd St Helens OR 97051

(10) STATIC WATER LEVEL:
360 ft. below land surface. Date 1-5-98
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 458

From	To	Estimated Flow Rate	SWL
458	460	3.5	360
650	650	36.5	360

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
Brown silt	0	4	
Red clay	4	24	
Tan clay	24	33	
Multicolored Basalt	33	40	
Clay Basalt	40	115	
Brown Basalt	115	133	
Same but Broken	133	140	
Clay Basalt	140	205	
Tan Clay Stone	205	215	
Clay Basalt	215	385	
Black Basalt	385	458	
Clay Basalt	458	539	360
Black Wood Brown Clay	539	587	
Multicolored Basalt	587	589	
Black Basalt	589	630	
Clay Broken Shale	630	650	360
Clay Shale	650	670	

Date started 1-24-98 Completed 2-5-98

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

TURNER WELL DRILLING
SCAPPOOSE, OR 97056

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1679
Signed Paul Turner Date 1-18-98

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

RECEIVED
FEB 20 1998
WATER RESOURCES DEPT.
SALEM, OREGON

WELL I.D. # L 20031
START CARD # 1036666

(1) OWNER: Well Number _____

Name Chris Iverson
Address 495 S 7th
City St Helens State OR Zip 97051

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:

☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 56' 6"

Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE				SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds	
10	0	98	Cement & Bentonite	0	98	89	
6	98	670					

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other _____

Backfill placed from _____ ft. to _____ ft. Material _____

Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	0	98	12	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liner:	4	16	560	160	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) 98'

(7) PERFORATIONS/SCREENS:

☒ Perforations Method Saw Cut

☐ Screens Type _____ Material _____

From	To	Slot size,	Number	Diameter	Tele/pipe size	Casing	Liner
486	506	5"	12	250	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
506	526	5"	13	250	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
526	246	5"	13	250	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>

(8) WELL TESTS: Minimum testing time is 1 hour

<input type="checkbox"/> Pump	<input type="checkbox"/> Bailer	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Flowing
Yield gal/min	Drawdown	Drill stem at	Time
40		480	1 hr.

Temperature of water 57 Depth Artesian Flow Found _____

Was a water analysis done? ☐ Yes By whom _____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____

Depth of strata: _____

(9) LOCATION OF WELL by legal description:

County Columbia Latitude _____ Longitude _____

Township 5 ☒ N or S Range 1 E or ☒ WM.

Section 28 N.E. 1/4 N.W. 1/4

Tax Lot 00803 Lot _____ Block _____ Subdivision _____

Street Address of Well (or nearest address) 36360 Pittsburg Rd

(10) STATIC WATER LEVEL:

260 ft. below land surface. Date 2-5-98

Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:

Depth at which water was first found 458

From	To	Estimated Flow Rate	SWL
458	462	3.5	260
620	650	36.5	260

(12) WELL LOG:

Ground Elevation _____

Material	From	To	SWL
Brown silt	0	4	
Red clay	4	24	
Tan clay	24	55	
Multicolored Basalt	55	90	
Gray Basalt	90	115	
Brown Basalt	115	133	
Same but broken	133	140	
Gray Basalt	140	205	
Tan Clay Stone	205	215	
Gray Basalt	215	383	
Black Basalt	383	458	
Gray Basalt	458	539	260
Black Wood Brown clay	539	587	
Multicolored Basalt	587	589	
Black Basalt	589	620	
Gray Broken Shale	620	650	260
Gray Shale	650	670	

Date started 1-24-98 Completed 2-5-98

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number _____

Signed _____ Date _____

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1679

Signed Tom C. Amerson Date 2-18-98

(as required by ORS 537.765)

Instructions for completing this report are on the last page of this report.

WATER RESOURCES DEPT

WELL ID #

(START CARD) # **W88364**

Well Number:

Name Columbia City
Address P.O. Box 189, 1840 2nd Street

City **Columbia City** State **OR** Zip **97018**

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☒ Abandonment

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other _____

☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other _____

Special Construction approval ☒ Yes ☐ No Depth of Completed Well 0 ft.
Explosives used ☐ Yes ☒ No Type _____ Amount _____

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E

☒ Other **See attached**

Backfill placed from _____ ft. to _____ ft. Material _____

Gravel placed from _____ ft. to _____ ft. Size of gravel _____

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8	40	117	.250	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	8	117	159	.322	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liner:					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) **159 feet**

☒ Perforations Method Mills knife

☐ Screens Type _____ Material _____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
40	102	3/8x2	244			<input checked="" type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>

☐ Pump ☐ Bailer ☒ Air ☐ Flowing
Artesian

Yield gal/min	Drawdown	Drill stem at	Time
0	-----		1 hr.

Temperature of Water _____ Depth Artesian Flow found _____

Was a water analysis done? ☐ Yes By whom _____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

County **Columbia** Latitude _____ Longitude _____
Township **5N** N or S. Range **1W** E or W. of WM.
Section **21** **SE** $\frac{1}{4}$ **SW** $\frac{1}{4}$
Tax Lot **00100** Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address)
6 th & Penn Street, Columbia City, Or.

_____ ft. below land surface. Date 9/4/98
Artesian pressure _____ lb. per square inch. Date _____

Depth at which water was first found

From	To	Estimated Flow Rate	SWL

Ground elevation

[illegible]Date started **9/1/98**

Completed **9/4/98**

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to my best knowledge and belief.

Signed _____ WWC Number _____
Date _____

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

Signed Dale McGhee WWC Number 1224
Date 9/21/98
Dale McGhee & Sons Well Drilling, Inc.

Colu
50807

DALE MCGHEE & SONS WELL DRILLING, INC.
3032 Allen Street Kelso, WA 98626 (360) 423-8493

The City of Columbia City
P.O. Box 189-1840 Second Street
Columbia City, Oregon 97018

Attention: Jim Bundy

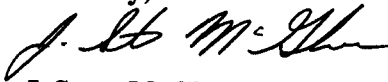
Re: The City of Columbia City well/start card # W-88364, Legal description: Section 21, Township 5N, Range 1W.

On 9/2/98 and 9/3/98 Mike McCord, well specialist, from Water Resources Department gave special permission to abandon this well in the following manner:

1. Install hole plug from 103' to 162 feet.
2. Perforate 8" casing from 40' to 102 feet.
3. Cut 8" casing at 40 feet.
4. Pump 8" hole with cement from 30' to 103 feet.
5. Install hole plug from 30' to 3".
6. Withdrew 8" casing from 0 to 40 feet.
7. Install cement from 3' to 5 feet.
8. Install top soil from 0 to 3 feet.

I appreciate the assistance Mike gave in this well.

Sincerely,



J. Steve McGhee

RECEIVED
SEP 24 1998
WATER RESOURCES DEPT.
SALEM, OREGON

STATE OF OREGON
WATER SUPPLY WELL REPORT

(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

WELL I.D. # 28296
START CARD # 27660

(1) OWNER: Well Number _____
Name Collector Wells Int. City of Seattle
Address P.O. Box 278
City ST. HELEN State ORE Zip 97704

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other DUG

(4) PROPOSED USE:
☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☒ Yes ☐ No Depth of Completed Well 68 ft.
Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE		SEAL			
Diameter	From To	Material	From To	Sacks or pounds	
16 5/8"	0	Cement	0	18	16,000
		Cement	9	15	16,000

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other SPICA STD.

Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER: Cast in place

Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing: 16 5/8"	0	68		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liner:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) _____

(7) PERFORATIONS/SCREENS: 11.7

From	To	Slot size	Number	Diameter	Material	Tele/pipe size	Casing	Liner
							<input type="checkbox"/>	<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>
							<input type="checkbox"/>	<input type="checkbox"/>

(8) WELL TESTS: Minimum testing time is 1 hour

Yield gal/min	Drawdown	Drill stem at	Time
11.7			1 hr.

Temperature of water _____ Depth Artesian Flow Found _____

Was a water analysis done? ☐ Yes By whom _____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____

Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County COLOMBIA Latitude _____ Longitude _____
Township 5N N or S Range 1W E or W. WM.
Section 28 SE 1/4 NE 1/4
Tax Lot _____ Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 1st & K St
COLUMBIA CITY OR

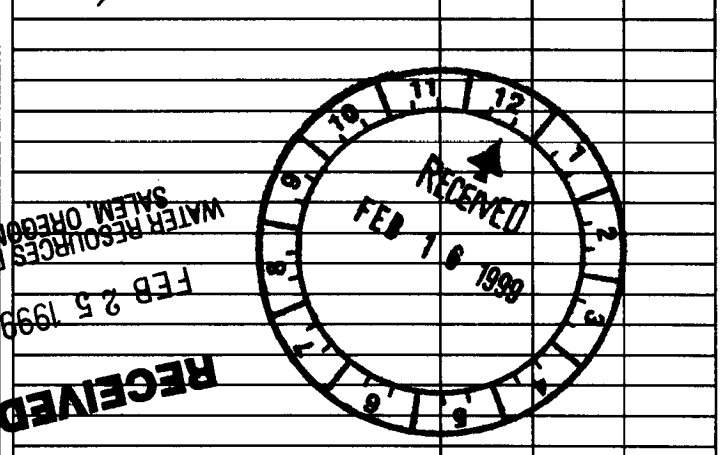
(10) STATIC WATER LEVEL:
18' ft. below land surface. Date 10-18-98
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 18'

From	To	Estimated Flow Rate	SWL
18 5/8"	68'	5.00 GPM	18'

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
SOIL RIVER ROCK	0	12	
SAND & CLAY ROCK	12	24	18
CLAY SAND ROCK	24	36	
CLAY SAND BOWERS	36	68	



Date started 10-9-98 Completed 1-22-99

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

Signed Collector Wells Int. WWC Number _____
Signed D. D. H. A. A. Date _____

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

Signed [Signature] WWC Number 660
Date 1-20-99

STATE OF OREGON
Water Supply Well Report

(as required by ORS 537.785)

COLU

Received Date:

Well ID Tag # L 42063

Start Card # 129489

Instructions for completing this report are on the last page of this form.

(1) Owner

Well Number: 4

Name:

CITY OF COLUMBIA CITY

Street: 1840 SECOND STREET / P.O. BOX 189

City: COLUMBIA CITY State: OR Zip Code: 97018

(2) Type of Work

- ☒ New ☐ Alter (Recondition) ☐ Alter (Repair)
☐ Deepening ☐ Abandonment

(3) Drill Method

- ☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
 Other: TUBEX UNDERREAMER

(4) Proposed Use

- ☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation ☐ Injection
☐ Livestock ☐ Thermal Other:

(5) Bore Hole Construction

- ☐ Special Standards: Depth of completed well: 529.00 ft.
☐ Explosives Used: Amount: Type:

Hole			Seal			Sacks/lbs
Diameter	From	To	Mtrl	From	To	
12	0	38	CE	0	18	16
9	38	400	BC	18	38	48
8	400	529				

How was seal placed?

Other: POURED

Back fill placed from:

Material:

Filter pack from:

Size:

(6) Casing / Liner

Casing/ Liner	Diameter	From	To	Gauge	Mtrl	Weld	Thrd	Shoe at	Shoe used
C	8	2	394	.250	S	X		394	

(7) Perforation / Screens

Perforations:									
Mtrl	From	To	Width	Height	#Slots	Dia.	t/pSize	Casing/ Lnr	Method

Screens:

Mtrl	From	To	S Size	#Slots	Dia.	t/pSize	Type	Gauge
------	------	----	--------	--------	------	---------	------	-------

(8) Well Tests (Minimum testing time is one hour)

Type	Yield	Units	Drawdown	Stem at	Duration
A	200.00	G		440	24.00
P	50.00	G	4		24.00

Temperature of Water: 54.00 F

Was water analysis done? ☒ Depth of artesian flow:

by whom? WATER TESTING LAB

Did any strata contain water unsuitable for use? ☐ Too Little ☐ Salty☐ Muddy ☐ Odor ☐ Colored other:

Depth of strata:

(9) Location of Hole by legal description

County: COLU Latitude: Longitude:

Township: 5.00 N Range: 1.00 W

Section: 28 NWSE Lot: Block:

Tax Lot: 03200 Subdivision:

Street Address of Well (or nearest address):

SOUTH OF NINTH & K STREET INTERSECTION

MAP, with location identified, must be attached.

(10) Static Water Level

Feet below land surface: 220.00 Date: 01 / 18 / 2001

Artesian Pressure: Date:

(11) Water Bearing Zones

Depth at which water was first found: 310.00 ft.

From	To	est Flow	swl
310	311	30	220
379	380	70	220
430	431	100	220

(12) Well Log

Ground Elevation: 370 ft.

Material	From	To	swl
BROWN HARD PAN	0	6	
RED BROWN HARD PAN	25	6	
BROWN SILT	25	29	
WEATHERED BASALT	29	33	
GRAY & BROWN BASALT	33	38	
GRAY BASALT	38	60	
GRAY & BROWN BROKEN BASALT	60	185	
BLACK BASALT	185	202	
VALCANIC TUFF & BASALT	202	310	
BLACK BASALT	310	320	220
HARD BLACK BASALT	320	379	
BROKEN BLACK BASALT	379	380	220
HARD BLACK BASALT	380	430	
BROKEN BLACK BASALT	430	431	220
HARD BLACK BASALT	431	460	
SAME AND WHITE SEAMS	460	473	
HARD BLACK BASALT	473	480	
VALCANIC TUFF GRAY	480	507	
M.C.- BROKEN & CAVING TUFF	507	515	
MULTICOLORED TUFF	515	529	

Date Started: 12 / 11 / 2000

Date Completed: 01 / 18 / 2001

(unbonded) Water Well Constructor Certification:

I certify that the work I perform on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed by:

MWC #:

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed by: THOMAS R DANNISON JR

TURNER WELL DRILLING

MWC #: 1679

Phone: 503-643-8383

MAY 09 2002

WATER RESOURCES DEPT
SALEM, OREGON

FEB 06 2003

STATE OF OREGON
WATER SUPPLY WELL REPORT
 (as required by ORS 537.765)

WATER RESOURCES DEPT.
 SALEM, OREGON

(WELL I.D.)# L 57954

(START CARD) # 143368

Instructions for completing this report are on the last page of this form.

(1) OWNER:

Well Number Harvard ParkName City of Columbia CityAddress PO Box 189City Columbia CityState ORZip 97018

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☒ Rotary Air ☒ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:

☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 410 ft.Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE

SEAL

Diameter	From	To	Material	From	To	Sacks or pounds
12	0	18	bentonite	0	17	22 sks
10	18	284	cement	17	282	105 sks
8	284	410				

How was seal placed: Method ☐ A ☒ B ☒ C ☐ D ☐ E☒ Other bentonite was poured & probed

Backfill placed from _____ ft. to _____ ft. Material _____

Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing: 8	+2	282	.250	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liner:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) 282

(7) PERFORATIONS/SCREENS:

☐ Perforations

Method _____

☐ Screens

Type _____

Material _____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump☐ Bailer☒ Air☐ Flowing
☐ Artesian

Yield gal/min	Drawdown	Drill stem at	Time
75		410	1 hr.

Temperature of water ~55F Depth Artesian Flow Found _____

Was a water analysis done? ☒ Yes By whom OwnerDid any strata contain water not suitable for intended use? ☐ Too little☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☒ Other high TDSDepth of strata: 315-364

(9) LOCATION OF WELL by legal description:

County Columbia Latitude _____ Longitude _____Township 5 N Range 1 W WM.Section 21 SW 1/4 SE 1/4Tax Lot 100 Lot _____ Block _____ Subdivision _____Street Address of Well (or nearest address) none assigned: well is in City Park between Penn & Calvin Streets & west of Sixth St. in Col. City

(10) STATIC WATER LEVEL:

104 ft. below land surface.Date 1/10/03

Artesian pressure _____ lb. per square inch.

Date _____

(11) WATER BEARING ZONES:

Depth at which water was first found 1st significant @ 315

From	To	Estimated Flow Rate	SWL
315	364	see (8)	see (10)

(12) WELL LOG:

Ground Elevation _____

Material	From	To	SWL
Top soil & clay, brown, sandy	0	5	
Cobbles, gravel & clay, brown, silty	5	19	
Cobbles & gravel	19	38	
Gravel, .5"- & some sand, brown, coarse	38	104	
Gravel, 1"- with clay, grey & some wood	104	127	
Clay, brown, medium	127	149	
Claystone, dark grey - black, medium	149	194	
Claystone, dark grey, hard	194	203	
Claystone, brn-blue, med, w/some soft clay	203	224	
Claystone, multi-colored, med, w/some clay	224	233	
Claystone, red-brn, med w/some soft clay	233	241	
Claystone, multi-colored, med, w/some clay	241	244	
Basalt, dark grey, med-soft, brkn, vesicular	244	273	
Basalt, dark grey, med-hd, some fractures	273	315	
Basalt, grey & red, med, frac, w/clay, red	315	325	
Basalt, red, soft, brkn, ves w/some clay, red	325	340	
Basalt, black & red, soft, broken, vesicular	340	355	
Basalt, red & black, soft, broken, vesicular	355	364	
Basalt, dark grey, medium fractured	364	395	
Basalt, grey, hard, some fractures	395	410	

Date started 12/4/02Completed 1/10/03

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

Signed Samuel Pennington WWC Number 1746
 Date 2/4/03

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

Signed Stephen J. Schmuck WWC Number 649
 Date 2/4/03

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

WELL I.D. # L 76752
START CARD # 173188

(1) OWNER: Well Number _____
Name City of Columbia City
Address 1840 Second St.
City Columbia City State OR Zip 97018

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 143 ft.
Explosives used ☐ Yes ☒ No Type _____ Amount _____

HOLE			SEAL			Sacks or pounds
Diameter	From	To	Material	From	To	
16"	0	143'	Cement	0	92	128 sks.

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other _____

Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from 93 ft. to 143 ft. Size of gravel 6 x 9

(6) CASING/LINER:

Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing: 12"	+1'4"	107'5"	.250	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12"	138	143	.250	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liner:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Final location of shoe(s) 143' shoe cut off at 138'

(7) PERFORATIONS/SCREENS:

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
107'5"	138	.070		12"	Pipe	<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>

(8) WELL TESTS: Minimum testing time is 1 hour

<input type="checkbox"/> Pump	<input checked="" type="checkbox"/> Bailer	<input type="checkbox"/> Air	<input type="checkbox"/> Flowing Artesian
Yield gal/min	Drawdown	Drill stem at	Time
50	32'6"		1 hr.

Temperature of water 53 Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Yes ☐ No
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County Columbia Latitude _____ Longitude _____
Township 5N N or S Range 1W E or W. WM.
Section 28 SW 1/4 NE 1/4
Tax Lot 4400 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 1755 Second Place
Columbia City, OR

(10) STATIC WATER LEVEL:
72'6" ft. below land surface. Date 9-18-06
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 87'

From	To	Estimated Flow Rate	SWL
87'	89'	5	68'
98'	138'	45 - 50	72'6"

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
Fill material	0	8	
Brown sand & clay	8	28	
Brown sandy clay & gravel	28	36	
Gravel, brown silty sand	36	81	
Gravel, clay & sand brown & gray	81	87	
Gravel, sand silty brown & gray	87	89	68
Gravel, clay & sand brown & gray	89	96	
Gravel, sand silty brown & gray	96	128	72'6"
Gravel sand silty, some clay	128	131	
brown and gray			
Gravel, sand silty brown & gray	131	138	72'6"
Gravel, sand, clay brown & gray	138	140	
Clay gray	140	143	

Date started 6-1-06 Completed 9-18-06

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief. Terry Johnson
Signed _____ WWC Number 1321
Date 10-20-06

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief. Ron Aspaas
Signed _____ WWC Number 1445
Date 10-20-06

NOV 13 2006

