

Groundwater Application Review Summary Form

Application # G- 19000

GW Reviewer Jen Woody Date Review Completed: 11/15/2022

Summary of GW Availability and Injury Review:

☐ Groundwater for the proposed use is either over appropriated, will not likely be available in the amounts requested without injury to prior water rights, OR will not likely be available within the capacity of the groundwater resource per Section B of the attached review form.

Summary of Potential for Substantial Interference Review:

☐ There is the potential for substantial interference per Section C of the attached review form.

Summary of Well Construction Assessment:

☐ The well does not appear to meet current well construction standards per Section D of the attached review form. Route through Well Construction and Compliance Section.

This is only a summary. Documentation is attached and should be read thoroughly to understand the basis for determinations and for conditions that may be necessary for a permit (if one is issued).

WATER RESOURCES DEPARTMENT

MEMO

November 15, 2022

TO: Application G- 19000

FROM: GW: Jen Woody
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES The source of appropriation is hydraulically connected to a State Scenic
☒ NO Waterway or its tributaries

☐ YES
☒ NO Use the Scenic Waterway Condition (Condition 7J)

☐ Per ORS 390.835, the Groundwater Section is **able** to calculate ground water interference with surface water that contributes to a Scenic Waterway. The calculated interference is distributed below

☐ Per ORS 390.835, the Groundwater Section is **unable** to calculate ground water interference with surface water that contributes to a scenic waterway; **therefore, the Department is unable to find that there is a preponderance of evidence that the proposed use will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway**

DISTRIBUTION OF INTERFERENCE

Calculate the percentage of consumptive use by month and fill in the table below. If interference cannot be calculated, per criteria in 390.835, do not fill in the table but check the "unable" option above, thus informing Water Rights that the Department is unable to make a Preponderance of Evidence finding.

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date 11/15/2022
 FROM: Groundwater Section Jen Woody
 SUBJECT: Application G- 19000 Supersedes review of 8/31/2020, 11/15/2021
 Date of Review(s)

PUBLIC INTEREST PRESUMPTION; GROUNDWATER

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525. Department staff review groundwater applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. This review is based upon available information and agency policies in place at the time of evaluation.*

A. GENERAL INFORMATION: Applicant's Name: City of Scappoose County: Columbia

A1. Applicant(s) seek(s) 0.8 cfs from 3 well(s) in the Willamette Basin,
Lower Willamette subbasin

A2. Proposed use Municipal Seasonality: Year Round (580 AF total)

A3. Well and aquifer data (attach and number logs for existing wells; mark proposed wells as such under logid):

Well	Logid	Applicant's Well #	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, e.g. 2250' N, 1200' E fr NW cor S 36
1	PROP	MR-B-1	CRB	0.8	3N/1W-7 SENW	2400' S, 1610' E fr NW cor S 7
2	PROP	MR-B-2	CRB	0.8	3N/1W-7 NESW	2810' S, 1370' E fr NW cor S 7
3	PROP	MR-B-3	CRB	0.8	3N/1W-7 SWNW	1680' S, 710' E fr NW cor S 7

* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)	Perforations Or Screens (ft)	Well Yield (gpm)	Draw Down (ft)	Test Type
1	10	-	-	-	1000	0-300	0-700	-	320-700	-	-	-
2	10	-	-	-	1000	0-300	0-700	-	320-700	-	-	-
3	30	-	-	-	1000	0-300	0-700	-	320-700	-	-	-

Use data from application for proposed wells.

A4. **Comments:** Applicant proposes the construction parameter s above based on a conceptual model of the hydrogeologic system, with the intention of accessing a Columbia River Basalt Group (CRBG) aquifer. This re-review considers a revised application submitted 9/3/2021, in which the total requested rate was reduced from 2 cfs to 0.8 cfs and the total annual volume was reduces from 1448 acre-feet to 580 acre-feet.

A5. ☒ **Provisions of the** Willamette Basin rules relative to the development, classification and/or management of groundwater hydraulically connected to surface water ☐ **are, or** ☒ **are not**, activated by this application. (Not all basin rules contain such provisions.)
 Comments: The well will produce from a confined aquifer, so the pertinent basin rules (OAR 690-502-0240) do not apply.

A6. ☐ **Well(s) #** _____, _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction.
 Name of administrative area: _____
 Comments: N/A

B. GROUNDWATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

B1. **Based upon available data**, I have determined that groundwater* for the proposed use:

- a. ☐ is over appropriated, ☒ is not over appropriated, or ☐ cannot be determined to be over appropriated during any period of the proposed use. * This finding is limited to the groundwater portion of the over-appropriation determination as prescribed in OAR 690-310-130;
- b. ☐ will not or ☐ will likely be available in the amounts requested without injury to prior water rights. * This finding is limited to the groundwater portion of the injury determination as prescribed in OAR 690-310-130;
- c. ☐ will not or ☐ will likely to be available within the capacity of the groundwater resource; or
- d. ☒ will, if properly conditioned, avoid injury to existing groundwater rights or to the groundwater resource:
 - i. ☒ The permit should contain condition #(s) 71 (Willamette basalt condition), large water-use reporting
 - ii. ☐ The permit should be conditioned as indicated in item 2 below.
 - iii. ☒ The permit should contain special condition(s) as indicated in item 3 below;

- B2.
- a. ☐ Condition to allow groundwater production from no deeper than _____ ft. below land surface;
 - b. ☐ Condition to allow groundwater production from no shallower than _____ ft. below land surface;
 - c. ☒ Condition to allow groundwater production only from the a single basalt aquifer in the Columbia River Basalt Group aquifer system groundwater reservoir between approximately _____ ft. and _____ ft. below land surface;
 - d. ☐ Well reconstruction is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Groundwater Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): _____

B3. **Groundwater availability remarks:** _____

Special Conditions**1. Basalt well construction conditions:**

- a. Each basalt well shall be open to a single aquifer of the Columbia River Basalt Group and shall meet the applicable well construction standards (OAR 690-200 and OAR 690-210). In addition, the open interval in each well shall be no greater than 100 feet. However, an open interval of greater than 100 feet may be allowed if substantial evidence of a single aquifer completion can be demonstrated to the satisfaction of the Department hydrogeologists, using information from a video log, downhole flowmeter, water chemistry and temperature, or other downhole geophysical methods. These methods shall characterize the nature of the basalt rock and assess whether water is moving in the borehole. Any discernable movement of water within the well bore when the well is not being pumped shall be assumed as evidence of the presence of multiple aquifers in the open interval.
- b. If during well construction it becomes apparent that the well can be constructed to eliminate commingling between aquifers in a manner other than specified in this permit, the permittee can contact the Department Hydrogeologist for this permit or the Groundwater Hydrology Section Manager to request approval of such construction. The request shall be in writing, and shall include a rough well log and a proposed construction design for approval by the Department. The request can be approved only if it is received and reviewed prior to placement of any permanent casing and sealing material. If the request is made after casing and seal are placed, the requested modification will not be approved. If approved, the new well depth and construction specifications will be incorporated into any certificate issued for this permit.

- c. The applicant shall coordinate with the driller to ensure that drill cuttings are collected at 10-ft intervals and at changes in formation in each well. A split of each sampled interval shall be provided to the Department.
- d. Copies of all geologic and hydrogeologic reports completed for the permittee during the development of the wells, including geophysical well logs and borehole video logs, shall be provided to the Department. Except for borehole video logs, two paper copies, or a single electronic copy, shall be provided of each report. Digital tables of any data shall be provided upon request.
- e. Prior to using water on this permit, the permittee shall ensure that the well on this permit has an OWRD Well Identification Number (Well ID or Well tag number). If a well does not have a Well ID, the permittee shall apply for one from the Department. The Well ID shall be attached to the well and shall be used as a reference identification number for any correspondence regarding the well including any water use, water level, or pump test reports.

Groundwater for the proposed use is determined not over-appropriated in Section B1a because there is minimal use in this CRBG aquifer. Other CRBG wells are located more than one mile away and are associated with exempt and therefore small uses.

The wells are located in the Columbia River Basin, on the alluvial floodplain sediments west of Multnomah Channel. The proposed construction is intended to access the CRBG aquifer system, though the structure of the basalt aquifers is highly uncertain in this area due to the lack of basalt wells for reference. The CRBG outcrops in the Tualatin Mountains and dips eastward underneath the sedimentary aquifer system, with a contact just over 1 mile west of the subject wells (Conlon, 2005; Woodward *et al.*, 1998). To the southwest of Scappoose, erosion by streams has exposed the marine sedimentary rocks that underlie the CRBG.

Although unconfined groundwater occurs near the surface of the basalts, most water occurs in confined aquifers within thin rubble zones (interflow zones) that occur at the contacts between lava flows. The thick interiors of the basalt flows generally have very low porosity and permeability and act as confining beds. This physical geometry generally produces a stack of thin, tabular aquifers (interflow zones) separated by thick confining beds (flow interiors). Because of the low permeability of the basalt flow interiors, the natural connection between the stacked aquifers is general very limited (very inefficient). As a result, hydraulic heads in the individual aquifers can be substantially different, especially in upland areas where the basalts crop out at land surface. Because the aquifers are confined (storativity is commonly on the order of 0.0001), hydraulic diffusivity is generally very high, which causes the cone of depression to propagate outward at rapid rates to impact nearby wells and hydraulically connected springs and streams. In the absence of barriers to horizontal flow, impacts can occur at distances up to a mile within a matter of minutes.

There is uncertainty regarding the potential yield and long-term sustainability to a well constructed into the target aquifer. The application references basalt well yields in the Tualatin Valley, but local information does not indicate the aquifer is similarly productive in Scappoose. Nearby basalt wells report yields between 30 and 450 gpm on well logs, far short of the requested 898 gpm (0.8 cfs). It is possible that drilling multiple wells will increase the yield in the short term, but if they access the same basalt aquifer, interference will quickly reduce the combined sustainable yield. Other community basalt water supply systems in Columbia County have experienced rapid and sustained declines on the order of 25-100 feet of decline since development began (see COLU 51275, COLU 821, COLU 52200). This indicates the aquifer extent is likely limited, and production from those particular sections of the CRBG exceeds natural recharge. This new development may encounter a similarly limited aquifer extent. Therefore, water level decline conditions are recommended to monitor the sustainability of this new proposed use.

The nearest well known to access basalt is COLU 52098, an exempt well located approximately 1.25 miles west of the subject wells. The potential for interference with this well from the proposed use was modeled using the Theis, (1935) equation for drawdown in a confined aquifer and parameters from nearby pumping tests (see Theis Drawdown Analysis below). Results indicate that the proposed use would cause well-to-well interference with COLU 52098 likely limited to less than 15 feet over 6 months of continuous pumping at the maximum proposed rate (0.8 cfs) from Well #3. Therefore, the conditions proposed above should avoid injury to other groundwater users and to the groundwater resource.

C. GROUNDWATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040**C1. 690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	CRBG	☒	☐
2	CRBG	☒	☐
3	CRBG	☒	☐

Basis for aquifer confinement evaluation: Wells in the CRBG typically develop water from confined aquifers. This is seen in nearby CRBG well logs, which report static water levels rise above the water-bearing zone, indicating a confined aquifer or series of aquifers.

C2. 690-09-040 (2) (3): Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected?			Potential for Subst. Interfer. Assumed?	
						YES	NO	ASSUMED	YES	NO
1	1	Scappoose Creek	25-75	25-35	5000	☐	☒	☐	☐	☒
1	2	Vernonia Creek	25-75	73	9600	☒	☐	☐	☐	☒
1	3	S. Scappoose Creek	25-75	88	8200	☒	☐	☐	☐	☒
2	1	Scappoose Creek	25-75	25-35	5200	☐	☒	☐	☐	☒
2	2	Vernonia Creek	25-75	73	9600	☒	☐	☐	☐	☒
2	3	S. Scappoose Creek	25-75	88	8200	☒	☐	☐	☐	☒
3	1	Scappoose Creek	25-75	25-35	3900	☐	☒	☐	☐	☒
3	2	Vernonia Creek	25-75	73	8400	☒	☐	☐	☐	☒
3	3	S. Scappoose Creek	25-75	88	7100	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: SW #1 sits atop alluvial sediments that are not likely hydraulically connected with the CRBG aquifer system. SW #2 and SW #3 incise through the CRBG to the west of the subject wells, until the CRBG is overlain by the sedimentary aquifer system roughly 1 mile west of the subject wells. The range of plausible GW elevations was estimated using the elevations of static water levels reported on the well logs of COLU 52098 and COLU 54539. SW elevation for SW #1 was estimated using the range of elevations within the Scappoose Creek WAB within 1 mile of the subject wells. SW elevations for SW #2 and SW #3 were estimated using the elevation at the point of nearest contact between the CRBG and alluvial sediments along the creeks, as mapped by Woodward *et al.* (1998).

Water Availability Basin the well(s) are located within: No WAB applies to the location of the applicant's wells, but use of groundwater from the basalt aquifer was evaluated for potential impacts to 3 nearby WABs:

1. SCAPPOOSE CR > SCAPPOOSE BAY - AT MOUTH (WID 30201202)
2. N SCAPPOOSE CR > SCAPPOOSE CR - AT MOUTH (WID 145)
3. S SCAPPOOSE CR > SCAPPOOSE CR - AT MOUTH (WID 30201203)

C3a. 690-09-040 (4): Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water (SW) source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that SW source, not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% *natural* flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked ☒ box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
		☐	☐			☐		☐		☐

C3b. **690-09-040 (4):** Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells.** Otherwise same evaluation and limitations apply as in C3a above.

	SW #		Q _w > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Q _w > 1% ISWR?	80% Natural Flow (cfs)	Q _w > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
			☐			☐		☐		☐

Comments: None of the hydraulically-connected SW sources have points of hydraulic connection within 1 mile of the subject wells, so section C3 was not evaluated.

C4a. **690-09-040 (5):** Estimated impacts on **hydraulically connected surface water sources greater than one mile** as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.													
(B) = 80 % Nat. Q													
(C) = 1 % Nat. Q													
(D) = (A) > (C)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(E) = (A / B) x 100		%	%	%	%	%	%	%	%	%	%	%	%

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

Basis for impact evaluation: Surface water depletion was not estimated due to the lack of a readily available model that is suitable for streams incised through stratiform basalt aquifers.

C4b. **690-09-040 (5) (b)** The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.

- C5. ☐ **If properly conditioned**, the surface water source(s) can be adequately protected from interference, and/or groundwater use under this permit can be regulated if it is found to substantially interfere with surface water:
- ☐ The permit should contain condition #(s) _____;
 - ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions:** While all wells are hydraulically connected with SW #2 and SW #3, the point of hydraulic connection is beyond 1 mile, and a suitable model was not readily available to evaluate stream depletion. Therefore, PSI was not found for any combinations of wells and surface water sources.

References Used:

Conlon, T.D., 2005. Ground-Water Hydrology of the Willamette Basin, Oregon. Scientific Investigations Report.

Theis, C.V., 1935. The Relation between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-Water Storage. Eos, Transactions American Geophysical Union 16:519–524.

Woodward, D.G., M.W. Gannett, and J.J. Vaccaro, 1998. Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington. U.S. G.P.O. ; For sale by U.S. Geological Survey, Information Services, Washington : Denver, CO.

D. WELL CONSTRUCTION, OAR 690-200

D1. Well #: _____ Logid: _____

D2. **THE WELL does not appear to meet current well construction standards based upon:**

- a. ☐ review of the well log;
- b. ☐ field inspection by _____;
- c. ☐ report of CWRE _____;
- d. ☐ other: (specify) _____

D3. **THE WELL construction deficiency or other comment is described as follows:** _____

D4. ☐ **Route to the Well Construction and Compliance Section for a review of existing well construction.**

Water Availability Tables

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

Watershed ID #: 30201202 SCAPPOOSE CR > SCAPPOOSE BAY - AT MOUTH
 Time: 1:37 PM Basin: WILLAMETTE Exceedance Level: 80
 Date: 08/14/2020

Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
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Monthly values are in cfs.

Storage is the annual amount at 50% exceedance in ac-ft.

JAN	119.00	6.15	113.00	0.00	0.00	113.00
FEB	140.00	6.18	134.00	0.00	0.00	134.00
MAR	129.00	6.09	123.00	0.00	0.00	123.00
APR	90.30	6.28	84.00	0.00	0.00	84.00
MAY	52.80	6.72	46.10	0.00	0.00	46.10
JUN	25.50	9.88	15.60	0.00	0.00	15.60
JUL	11.10	10.20	0.88	0.00	0.00	0.88
AUG	7.24	10.10	-2.81	0.00	0.00	-2.81
SEP	5.85	9.56	-3.71	0.00	0.00	-3.71
OCT	9.10	6.10	3.00	0.00	0.00	3.00
NOV	18.60	6.08	12.50	0.00	0.00	12.50
DEC	70.40	6.14	64.30	0.00	0.00	64.30
ANN	71,800	5,410	66,400	0	0	66,400

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

Watershed ID #: 145 N SCAPPOOSE CR > SCAPPOOSE CR - AT MOUTH Exceedance Level: 80
 Time: 1:35 PM Basin: WILLAMETTE Date: 08/14/2020

Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft.						
JAN	63.90	0.16	63.70	0.00	7.00	56.70
FEB	76.00	0.18	75.80	0.00	7.00	68.80
MAR	70.30	0.09	70.20	0.00	7.00	63.20
APR	49.20	0.20	49.00	0.00	7.00	42.00
MAY	28.90	0.44	28.50	0.00	7.00	21.50
JUN	14.60	0.53	14.10	0.00	3.00	11.10
JUL	6.55	0.72	5.83	0.00	3.00	2.83
AUG	4.31	0.62	3.69	0.00	1.00	2.69
SEP	3.47	0.35	3.12	0.00	1.00	2.12
OCT	5.46	0.11	5.35	0.00	1.00	4.35
NOV	11.10	0.10	11.00	0.00	7.00	4.00
DEC	38.60	0.15	38.40	0.00	7.00	31.40
ANN	39,300	222	39,000	0	3,490	35,500

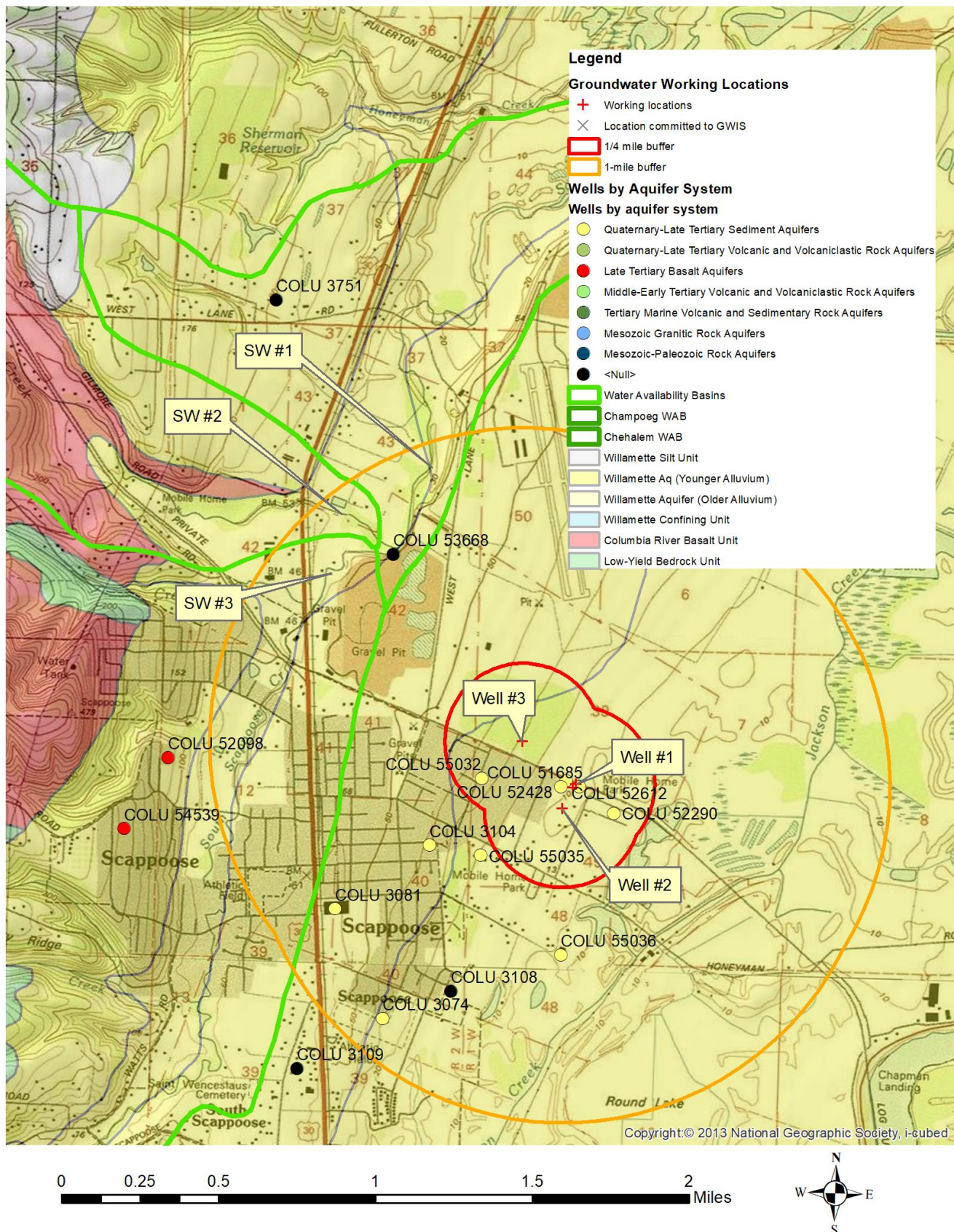
DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

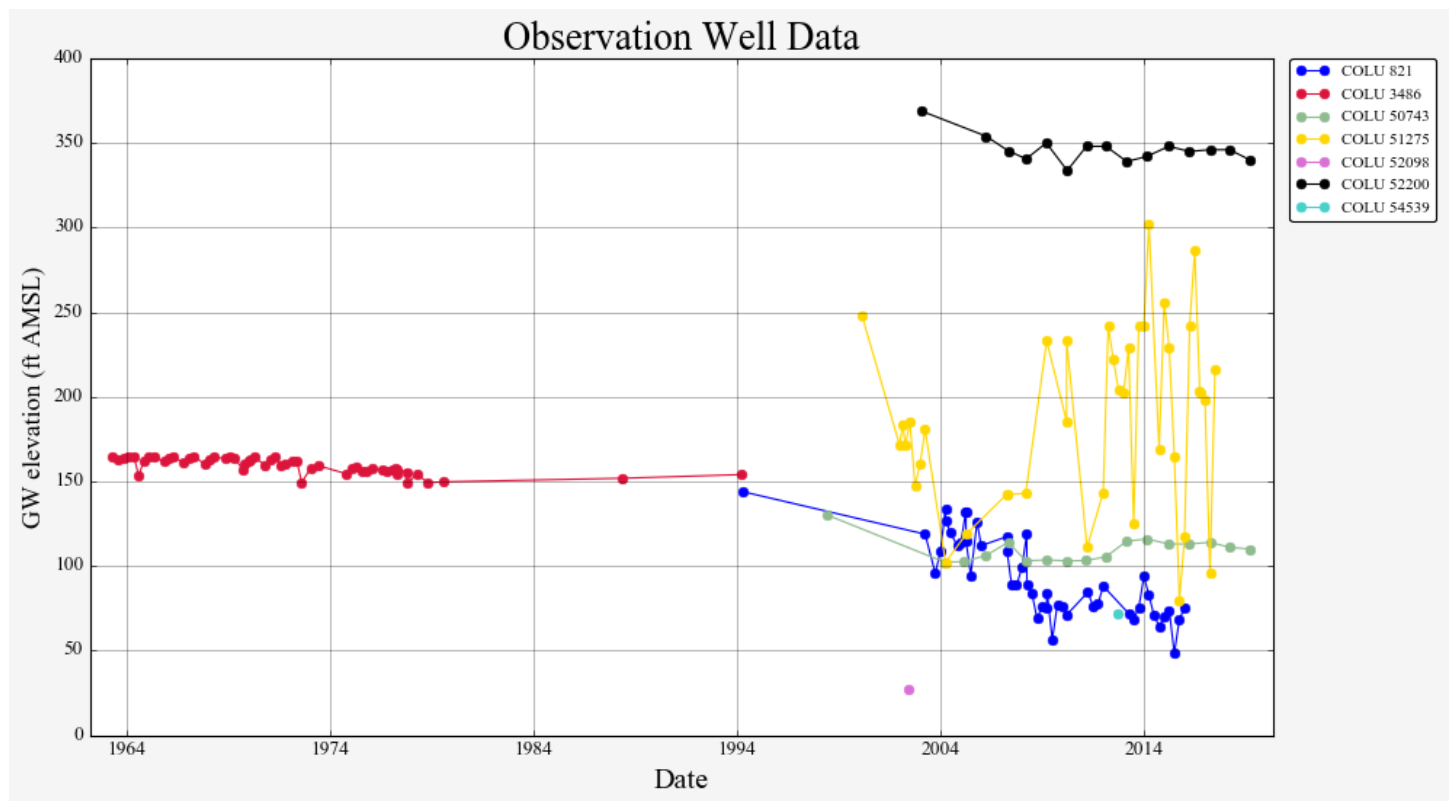
Watershed ID #: 30201203 S SCAPPOOSE CR > SCAPPOOSE CR - AT MOUTH Exceedance Level: 80
 Time: 1:38 PM Basin: WILLAMETTE Date: 08/14/2020

Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft.						
JAN	49.60	14.50	35.10	0.00	0.00	35.10
FEB	59.50	14.50	45.00	0.00	0.00	45.00
MAR	54.40	14.50	39.90	0.00	0.00	39.90
APR	36.80	14.50	22.30	0.00	0.00	22.30
MAY	20.80	14.70	6.07	0.00	0.00	6.07
JUN	9.65	14.80	-5.15	0.00	0.00	-5.15
JUL	3.95	15.00	-11.00	0.00	0.00	-11.00
AUG	2.49	14.90	-12.40	0.00	0.00	-12.40
SEP	1.98	14.70	-12.70	0.00	0.00	-12.70
OCT	3.12	14.50	-11.40	0.00	0.00	-11.40
NOV	6.71	14.50	-7.75	0.00	0.00	-7.75
DEC	28.70	14.50	14.20	0.00	0.00	14.20
ANN	30,100	10,600	22,000	0	0	22,000

Well Location Map

G-19000 Scappoose: 3N/1W-7



Water-Level Trends in Nearby Wells Accessing Columbia River Basalt Group Aquifers

Well interference modeling results. Units for T are ft²/day

This is drawdown at $r = 6000$ ft from pumping well

