File No. G2-30617
WAC Doc ID: 5768539

DEPARTMENT OF
ECOLOGY
State of Washington

State of Washington
REPORT OF EXAMINATION
FOR WATER RIGHT APPLICATION

PRIORITY DATE	APPLICATION NUMBER
May 30, 2013	G2-30617

MAILING ADDRESS	SITE ADDRESS (IF DIFFERENT)
Public Utility District No. 1 of Thurston County	921 Lakeridge Way SW, Suite 301 Olympia, WA 98502

Quantity Authorized for Withdrawal or Diversion

DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
510	gpm	

Purpose

PURPOSE	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Municipal	510		gpm			Year-round as needed

Source Location

WATERBODY	TRIBUTARY TO	COUNTY	WATER RESOURCE INVENTORY AREA
3 Wells		Thurston	13

SOURCE FACILITY/DEVICE	PARCEL	TWN	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Gaudio Well	78801400000	18N	1W	15	SE,NE	47°02'59.64"N	122°47'05.76"W
Coker Well	78801400000	18N	1W	15	SE,NE	47°02'59.80"N	122°47'05.27"W
Taylor Well	78801400000	18N	1W	15	SE,NE	47°02'58.92"N	122°47'02.44"W

Datum: WGS84

Place of Use (See Map, Attachment 1)

PARCEL

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

See Map, Attachment 1. See also RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Proposed Works

One 12-inch well (Gaudio) completed to 186 feet; one 12-inch well (Coker) completed to a depth of 269 feet; and one 16-inch well (Taylor) completed to a depth of 270.5 feet.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Started	Completed	September 1, 2029

Measurement of Water Use

How often must water use be measured?	Monthly
How often must water use data be reported to Ecology?	Annually (Jan 31)
What volume should be reported?	Total Annual Volume
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm)

Provisions

Measurements, Monitoring, Metering and Reporting

An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173, which describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Recorded water use data shall be submitted via the Internet. To set up an Internet reporting account, contact the Southwest Regional Office. If you do not have Internet access, you can still submit hard copies by contacting the Southwest Regional Office for forms to submit your water use data.

Water Use Efficiency

Use of water under this authorization shall be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Proof of Appropriation

The water right holder shall file the notice of Proof of Appropriation of water (under which the certificate of water right is issued) when the permanent distribution system has been constructed and the quantity of water required by the project has been put to full beneficial use. The certificate will reflect the extent of the project perfected within the limitations of the permit. Elements of a proof inspection may include, as appropriate, the source(s), system instantaneous capacity, beneficial use(s), annual quantity, place of use, and satisfaction of provisions.

Schedule and Inspections

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices and associated distribution systems for compliance with water law.

Findings of Facts

Upon reviewing the investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated. Furthermore, I concur with the investigator that water is available from the source in question; that there will be no impairment of existing rights; that the purpose(s) of use are beneficial; and that there will be no detriment to the public interest.

Therefore, I ORDER approval of Application No. G2-30617, subject to existing rights and the provisions specified above.

Your Right To Appeal

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of the Order.

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Signed at Olympia, Washington, this 18th day of March 2014.

Michael J. Gallagher

Michael J. Gallagher, Section Manager
Water Resources Program/SWRO
Department of Ecology

BACKGROUND

On May 30, 2013, the **Public Utility District No. 1 of Thurston County** (PUD) filed an *Application for Water Right Permit* with the State Department of Ecology. The project site is the PUD's Tanglewilde\Thompson Place water system, located in Lacey, Washington. The PUD requested a water-right permit for an additional 510 gallons per minute (gpm) to meet their anticipated maximum demand for 1,050 gpm for the system. The proposed source of water is two wells and an older third well for backup. The purpose of use is for municipal supply.

This application has been processed under Ecology's Cost Reimbursement Program. Pacific Groundwater Group (PGG) prepared this report under contract to Ecology. PGG reviewed all available documents pertaining to this and other related *Applications for Water Right*, including site conditions, hydrogeological and well-testing reports, historical water use, and the standing of existing rights.

Under the provisions of RCW 90.03.290 and 90.44, a water right may be issued upon findings that water is available for appropriation for a beneficial use, and that the appropriation will not impair existing rights or be detrimental to the public welfare. In accordance with these provisions, I recommend issuance of Permit G2-30617.

Table 1
Summary of Application No. G2-30617

Attributes	*Proposed*
Applicant	**Public Utility District No. 1 of Thurston County**
Application Received	May 30, 2013
Instantaneous Quantity	510 gpm
Source	3 wells
Purpose of Use	Municipal supply
Period of Use	Year-round as needed
Place of Use	See Page 1

Legal Requirements for Application Processing

The following requirements must be met prior to processing a water-right application:

Public Notice

A public notice of the proposed appropriation was published in the Nisqually Valley News on November 1st and 8th, 2013. No protests were received as a result of this notice.

State Environmental Policy Act (SEPA)

A water-right application is subject to a SEPA threshold determination (i.e., an evaluation whether there are likely to be significant adverse environmental impacts) if any one of the following conditions are met.

- It is a groundwater-right application for more than 2,250 gpm
- It is an application that, in combination with other water right applications for the same project, collectively exceeds the amounts above;
- It is a part of a larger proposal that is subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA);
- It is part of a series of exempt actions that, together, trigger the need to make a threshold determination, as defined under WAC 197-11-305.

None of these situations apply to this application. Accordingly, the subject application is categorically exempt under SEPA (WAC 197-11-305 and WAC 197-11-800(4)).

Water Resources Statutes and Case Law

Under the provisions of RCW 90.03.290 and 90.44.050, a water right shall be issued upon findings that water is available for appropriation for a beneficial use and that the appropriation, as proposed in the application, will not impair existing rights or be detrimental to the public welfare.

This application has been processed under Ecology's Cost Reimbursement Program. Based on the provisions of RCW 43.21A.690 and RCW 90.03.265, Pacific Groundwater Group (PGG) prepared this report under contract to Ecology.

INVESTIGATION

Evaluation of this application included, but was not limited to, research and/or review of the following:

- Department of Ecology records of surface and groundwater rights and claims, and of well construction reports within the vicinity of the subject production wells.
- Documents and reports applicable to the area and project, including the PUD's 2009 Water System Plan, geologic maps by the Geology and Earth Resources Division of the Washington Department of Natural Resources, U. S. Geological Survey reports, project documents prepared for Source Approval by the Department of Health, and Robinson & Noble's 2010 report entitled "*Thurston Public Utility District – Construction and Testing of the Bob Coker and Don Taylor Production Wells for the Tanglewilde-Thompson Place Water System*."

A field visit was conducted on November 8, 2013, by Jill Van Hulle and Linton Wildrick, LHG, of Pacific Groundwater Group, in the company of Kim Grubbe, water-system manager for Thurston County PUD #1.

Project Description

The intent of this application is to secure a water-right permit that provides for additional instantaneous capacity (Qi), only. While the water rights currently associated with the system provide adequate water on an annual basis, the PUD will require additional instantaneous capacity from their Tanglewilde wells in order to meet future peaking capacity and State of Washington Department of Health Group A planning requirements. The production capacity of the wells is greater than authorized by their current water rights that limit the total number of connections the PUD can supply without reliance on an auxiliary intertie with the City of Olympia. An intertie will remain in place for emergency use.

Thurston PUD has owned the Tanglewilde\Thompson Place Water System since 1957. Previously, the PUD contracted with the City of Olympia to manage the water system, and the City delivered water to the system via an intertie. Recently, in the interest of developing a system that was not dependent on the Olympia intertie, two wells were placed into service on the site – the Bob "Coker Well" that was constructed in March of 2010, and the Don "Taylor Well" that was constructed in May of 2010. The Coker and Taylor wells, along with the third well, the Gaudio Well, are operated as a wellfield, and are equipped to provide 1,050 gpm, on an as-needed basis.

Site Description

The Tanglewilde\Thompson Place water system is located within the City of Lacey's Urban Growth Area in a residential and commercial area. The water system (WS ID 04397) supplies a population of approximately 4,500 people through 1,784, mostly residential, service connections.

The two active wells are located in the SE ¼ of the NE ¼, Section 15, T. 18N, R. 1W.W.M (see well location maps in Robinson Noble, 2010[1]). The Coker Well is approximately 140 feet east and 130 feet south of the centerline of the intersection of Husky Way SE and Wildcat Street SE. The Taylor Well is located 255 feet east of the Coker well and 140 feet south of the centerline of Husky Way SE. The wells have the unique well-identification tags of BBP283 and BAM165, respectively.

Water Rights Appurtenant to the Place of Use

The operation of the Tanglewilde system is currently authorized by three water rights.

- GWC 1688-A was issued for two wells in the SE ¼ of the SE ¼, Section 10, for 140 gpm and 224 acre-feet per year (afy);
- GWC 3577-A was issued for one well in the NW ¼ of the SE ¼ of the NE ¼ of Section 15, for 300 gpm and 480 afy;
- GWC 4344-A was issued for one well in the NE ¼ of the NW ¼ of Section 14, for 100 gpm and 160 afy. This right was issued as non-additive (supplemental) to 1688-A and 3577-A, which

[1] Robinson Noble, 2010. *Thurston Public Utility District – Construction and Testing of the Bob Coker and Don Taylor Production Wells for the Tanglewilde-Thompson Place Water System.*

together total 704 afy, for a community supply with an estimated requirement of 672 afy. Certificate 4344-A was issued such that "*any or all wells covered under these rights may be used to supply the system up to a total of 672 acre-feet per year which is deemed adequate to supply a population of 3,000 people,*" and the certificate confirmed that a total of "*704 acre-feet per year*" was available under the three rights.

A summary of the Tanglewilde Water System Water Rights is provided in Table 2 (below).

Table 2. Thurston PUD (Tanglewilde) Water System Water Rights

Certificate Issued to:	Water Right Number	Priority Date	Qi in gpm	Qa in afy
Alvin H. Thompson	GWC-1688-A	3/31/1953	140	224
Thurston PUD #1	GWC-3577 A	8/2/1957	300	480
Alvin H. Thompson	GWC-4344-A	6/29/1962	100 (supplemental)	160 (supplemental)
Totals			440	704

The PUD filed a *Showing of Compliance with RCW 90.44.100* that authorizes the Taylor and Cocker wells as withdrawal points to under the authorized point of withdrawal under GWC 3577-A. Based on the unique language in the ROE supporting GWC 4344-A providing that any or all wells covered under these rights may be used to supply the system, PUD's current production wells are consistent with the water right documents supporting the water system and the intent of the RCW. The PUD intends to exercise the additional Qi under this application from its existing wells; however the PUD may seek additional or replacement wells, as necessary, in the future.

The PUD's three current water rights authorize a withdrawal rate of 540 gpm and 704 afy.

The two active wells (Taylor and Coker) have been equipped to produce approximately 1,300 gpm; however, when they are operated simultaneously, the recommended maximum withdrawal rate is 1,050 gpm due to mutual interference drawdown. The Gaudio Well also can produce 60 gpm as a back-up supply. Because existing rights allow for a maximum of 540 gpm (440 gpm primary and 100 gpm supplemental), the PUD's request for an additional 510 gpm would bring the total authorized Qi to 1,050 gpm. The PUD's authorized annual quantity of 704 afy is equivalent to a continuous withdrawal of 436 gpm, a rate that is currently authorized by the PUD's water rights.

The rate of withdrawal reflects the size of the pumps installed in the wells. The PUD wells will not be operated at the rate of 1,050 on a continuous basis, because they are expected to cycle on and off as system demands arise and are met, and storage is replenished.

Well Construction and Testing

The Coker Well was drilled to 352 feet and completed with 12-inch casing. The casing was cut at a depth of 282 feet and pulled back to 203.5 feet. The 91-foot-long, 8-inch screen assembly contains 10-feet of

tail pipe, 61 feet of 60-slot (0.060-inch openings) screen, and a 20-foot riser pipe. Fifty-five of the 60 feet of screen are exposed to the aquifer. The screen is surrounded with a #6-9 Colorado sand pack.

The Don Taylor Well was drilled to 282 feet and completed with 16-inch casing. The casing was cut at a depth of 270.5 feet and pulled back to 194 feet. The 111-foot-long, 12-inch screen assembly includes a 15-foot tail pipe, 66 feet of 60-slot (0.060-inch openings) screen, and a 30-foot riser. Sixty-one and one half feet of the screen are exposed to the aquifer. The screen is surrounded with a #6-9 Colorado sand pack.

Aquifer Characterization and Site Hydrogeological Conditions

The regional hydrogeologic setting of the wellfield was presented in a report to the PUD in 2008 (Pacific Groundwater Group, 2008). The geology observed during the drilling of the Coker and Taylor Wells was generally consistent with the regional geology, as described.

The two active wells are completed in the Qc aquifer (Drost and others, 1998 and 1999[2]; a. k. a., Sea Level aquifer by informal reference). The overlying material is consistent with the Vashon Stade deposits described in regional studies, and the confining layer is consistent with the non-glacial and transition units described for the Hawks Prairie area by Drost and others (1998) and earlier by Noble and Wallace (1966).

- Both wells encountered thin aquifers at depths of about 40 and 110 feet that were judged to have insufficient yield for the water system's needs. The uppermost aquifer is the unconfined Qvr aquifer and the second thin aquifer is the Qva aquifer. The groundwater flow direction in these aquifers is generally toward the nearest stream or wetland.
- The aquitard intervening between the Qvr and Qva aquifers is the Qvt aquitard (glacial till).
- A silty clay and silty fine-sand aquitard, approximately 40 feet thick, was encountered beneath the upper aquifers and overlying the source aquifer and corresponds to the regional Qf aquitard. The surface seals for both wells are seated into this aquitard.
- The source aquifer (Qc) consists of a mix of medium-to-coarse sand and gravel and was encountered at a depth of 176 feet in the Coker Well and 178 feet in the Taylor Well. The flow direction in this aquifer is generally toward the marine bays of lower Puget Sound.
- Except for the Qvt aquitard, the hydrogeologic units are continuous across the Lacey and Hawks Prairie areas (Drost and others, ibid.).

Robinson Noble used the Cooper-Jacob and Theis analytical models for confined aquifers to analyze the data from the constant-rate tests of both wells in order to define the hydraulic characteristics of the aquifer. Based on the first 300 minutes of the respective tests, the models estimate that the average transmissivity of the aquifer is 7,350 feet-squared per day (ft^2/d), or 55,000 gallons per day per foot

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[2] Drost, B.W., Turney, G.L., Dion, N.P., and Jones, M.A., 1998. Hydrology and Quality of Ground Water in Northern Thurston County, Washington, US Geologic Survey WRI Report 92-4109 (revised).

Drost, B.W., Turney, G.L., Dion, N.P., and Jones, M.A., 1999. Conceptual Model and Numerical Simulation of the Ground-Water Flow System in the Unconsolidated Sediments of Thurston County, Washington. US Geologic Survey WRI Report 99-4165, 1999.

(gpd/ft), in proximity to the Coker Well and 8,700 ft^2/d (or 65,000 gpd/ft) in proximity to the Taylor Well. Robinson Noble further interpreted that later-time test data, which tend to reflect the average aquifer transmissivity over a much larger area, suggest that the aquifer has a higher transmissivity (or a greater permeability and/or thickness) at some unknown distance from the wells. Because this effect appears to be more pronounced in the Taylor Well than in the Coker Well, the consultants thought it likely that higher permeability material is encountered as the cone of depression expands eastward. The storage coefficient of the aquifer was calculated at 0.00006, which indicates a highly confined aquifer.

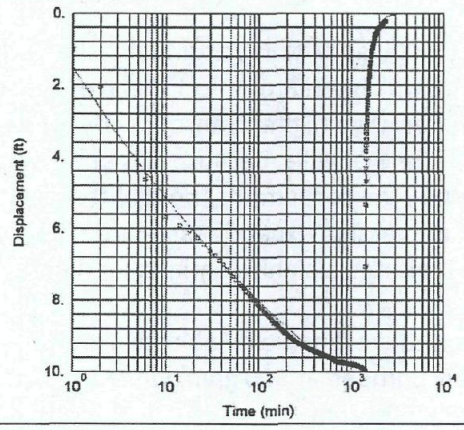
Based on specific capacities and interference drawdown from the other well, Robinson Noble recommended that the Don Taylor Well could be sustainably pumped at 600 gpm, while the Bob Coker Well is pumped at 300 gpm, for a total wellfield production of 900 gpm[3].

When two or more closely spaced wells are pumping at the same time, each well imposes drawdown on the other. This mutual interference causes all wells to have deeper pumping water levels at a given production rate than they would exhibit if pumping alone. In the case of the Tanglewilde Wellfield, it is presumed that the two active wells will, at times, be pumped concurrently, but that the Gaudio Well will serve as a backup well. Robinson Noble predicted that pumping both active wells at 900 gpm for 100 days would result in drawdown of approximately 12 feet a distance of 625 feet from the wells, and less than 10 feet at a distance of 1,125 feet from the pumping wells.

PGG re-evaluated the aquifer's response to pumping and found that the shape of the drawdown curve after 300 minutes more likely reflects a leaky aquifer condition than a purely confined condition, which also corresponds with the U. S. Geological Survey's conceptual model of the groundwater flow system in the area (Drost and others, 1998; 1999). The data from the 24-hour pumping test of the Taylor well fit the analytical leaky aquifer model of Moench, as implemented in the commercial software program Aqtesolv Pro™ (HydroSolve, 2012[4]); see **Figures 1 and 2** for data from the Coker and Gaudio observation wells, respectively. The leaky aquifer model fits the drawdown data better than do the two confined aquifer models used by Robinson & Noble. This can be seen in a comparison of the curves in Figures 1 and 2 (for the leaky aquifer model) with the corresponding curves for the confined aquifer models in Robinson and Noble (2010). The estimated aquifer-parameter values for the leaky aquifer response are:

- transmissivity -- 6,000 ft^2/d for the Coker observation well and 8,400 ft^2/d for the Gaudio observation well,
- storativity -- 0.000046 for the Coker observation well and 0.00031 for the Gaudio well.

[3] Currently, the wells are equipped to produce the recommended maximum of 1,050 gpm for short periods.
[4] Hydrosolv, 2012. *Aqtesolv Pro 4.5.*



COKER DRAWDOWN/RECOVERY DURING DON TAYLOR TEST

Data Set: C:\...\Fig1-Coker_MoenchCase1-Leaky_thinned&trimmed.aqt
Date: 11/14/13 Time: 14:10:08

PROJECT INFORMATION

Company: PGG
Client: WDOE
Project: JM1304
Location: TCPUD
Test Well: DonTaylor
Test Date: 8/9/10

SOLUTION

Aquifer Model: Leaky
Solution Method: Moench (Case 1)

T = 6040.3 ft^2/day
S = 4.614E-5
r/B' = 0.06818
ß' = 0.04206
r/B" = 0.
ß" = 0.
Sw = 0.
r(w) = 0.6667 ft
r(c) = 0.6667 ft

AQUIFER DATA

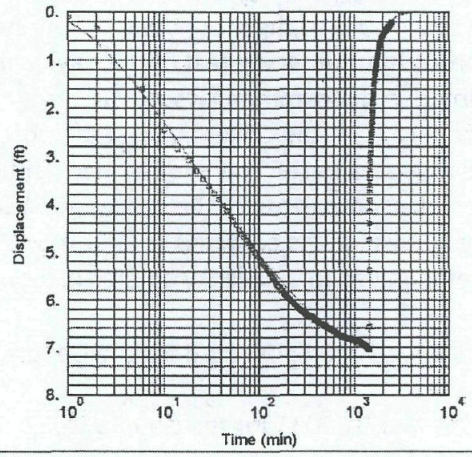
Saturated Thickness: 64. ft
Aquitard Thickness (b'): 325. ft

Anisotropy Ratio (Kz/Kr): 0.1
Aquitard Thickness (b"): 1. ft

Figure 1 Taylor Well Pumping Test, Hydraulic Property Estimates for Coker Well Drawdown and Recovery

JM1304
Thurston Co. PUD #1 CRA

PgG



GUADIO DRAWDOWN DURING DON TAYLOR TEST

Data Set: C:\...\Fig2-GaudioObsWell_Moench-Case1_thinned&trir
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PROJECT INFORMATION

Company: PGG
Client: WDOE
Project: JM1304
Location: TCPUD
Test Well: DonTaylor
Test Date: 8/9/10

SOLUTION

Aquifer Model: Leaky
Solution Method: Moench (Case 1)

T = 8391.2 ft^2/day
S = 0.000314
r/B' = 0.06893
ß' = 1.0E-5
r/B" = 0.
ß" = 0.
Sw = 0.
r(w) = 0.6667 ft
r(c) = 0.6667 ft

AQUIFER DATA

Saturated Thickness: 64. ft
Aquitard Thickness (b'): 325. ft

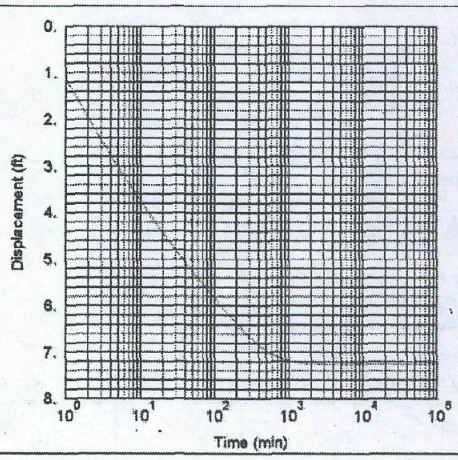
Anisotropy Ratio (Kz/Kr): 0.1
Aquitard Thickness (b"): 1. ft

Figure 2 Taylor Well Pumping Test, Hydraulic Property Estimates for Gaudio Well Drawdown and Recovery

JM1304
Thurston Co. PUD #1 CRA

PgG

Due to the leakage from overlying units, drawdown will stabilize after approximately one day of pumping, in contrast to a confined aquifer condition which would indicate that drawdown would be significantly larger and not stabilize. Conservatively assuming the estimated transmissivity value of 6,000 ft2/d (i. e., more drawdown than for a transmissivity of 8,400 ft^2/d), the leaky aquifer model indicates that, after one day of pumping the Taylor well at 510 gpm, the drawdown at the Coker well, at a distance of 255 feet, would stabilize at approximately 7.2 feet (**Figure 3**). Furthermore, at the Shattuck Well (the closest well not owned by the PUD), located about 1,500 feet from the Taylor Well (Table 1), the interference drawdown would stabilize at approximately 0.7 feet (**Figure 4**). The drawdown at greater distances from the Tanglewilde wellfield would be even less than at the Shattuck Well. Given the available drawdown of tens of feet in the aquifer in the area, the interference drawdown due to the Taylor Well will not impair the yield of surrounding wells, even for the extreme case of long-term, constant-rate pumping at 510 gpm, the maximum additive Qi under consideration.



COKERWELL-TAYLORPUMPING - TIME DRAWDOWN

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Date: 01/29/14 Time: 15:25:20

PROJECT INFORMATION

Company: PGG
Client: WDOE
Project: JM1304
Location: TCPUD
Test Well: DonTaylor
Test Date: 8/9/10

SOLUTION

Aquifer Model: Leaky
Solution Method: Moench (Case 1)

T = 6040.3 ft^2/day
S = 4.614E-5
1/B' = 0.0002672 ft^{-1}
ß'/r = 0.0001648 ft^{-1}
1/B" = 0. ft^{-1}
ß"/r = 0. ft^{-1}
Sw = 0.
r(w) = 0.6667 ft
r(c) = 0.6667 ft

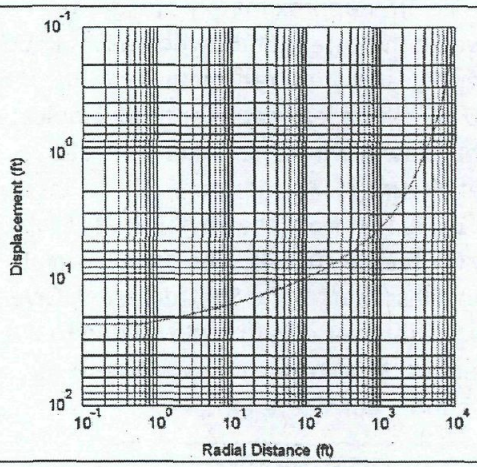
AQUIFER DATA

Saturated Thickness: 64. ft
Aquitard Thickness (b'): 325. ft
Anisotropy Ratio (Kz/Kr): 0.1
Aquitard Thickness (b"): 1. ft

Figure 3
Drawdown with Time in Coker Well for Taylor Well Pumping 510 GPM

JM1304
Thurston Co. PUD #1 CRA

PGG



COKER DRAWDOWN/RECOVERY DURING DON TAYLOR TEST

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PROJECT INFORMATION

Company: PGG
Client: WDOE
Project: JM1304
Location: TCPUD
Test Well: DonTaylor
Test Date: 8/9/10

SOLUTION

Aquifer Model: Leaky
Solution Method: Moench (Case 1)

T = 6040.3 ft^2/day
S = 4.614E-5
1/B' = 0.0002672 ft^{-1}
ß'/r = 0.0001648 ft^{-1}
1/B" = 0. ft^{-1}
ß"/r = 0. ft^{-1}
Sw = 0.
r(w) = 0.6667 ft
r(c) = 0.6667 ft

AQUIFER DATA

Saturated Thickness: 64. ft
Aquitard Thickness (b'): 325. ft
Anisotropy Ratio (Kz/Kr): 0.1
Aquitard Thickness (b"): 1. ft

Figure 4
Drawdown with Distance from Taylor Well Pumping 510 GPM for 100 Days

JM1304
Thurston Co. PUD #1 CRA

PGG

Table 1. Larger Diameter Wells Within Two Miles of Tanglewood-Thompson Place Wells.

Well Owner	Township	Range	Range E-W	Section	1/4 Section	1/4-1/4 Section	Well Depth (ft)	Well Diameter (in)
WOODLAND CREEK WATER ASSOCIATION	18	1	W	9	SE	NE	83	8
ALVIN THOMPSON	18	1	W	10	SE	SE	171	8
OLYMPIA SAND & GRAVEL CO.	18	1	W	10	SW		96	12
OLYMPIA SAND & GRAVEL CO.	18	1	W	10			96	12
TOM LUDRTIN	18	1	W	11			237	10
OLYMPIA MUSHROOM FARMS, INC.	18	1	W	14	NE	SE	64	8
OLYMPIA MUSHROOM FARMS, INC.	18	1	W	14	NE	SE	260	8
OSTROMS MUSHROOM FARM	18	1	W	14	NE	SE	357	8
ALVIN THOMPSON	18	1	W	14			226	12
JEWELL PAIGE	18	1	W	15	NE	NW	132	8
MARK SHATTUCK	18	1	W	15	NE	NW	242	8
CITY OF LACEY	18	1	W	16	NE	SE	40	12
CITY OF LACEY	18	1	W	16	NE	SE	40	30
DAVE LINDLEY	18	1	W	21	NE	NE	339	8
WESLEY OLYMPIA	18	1	W	23	NE	SW	32	36

Effect on Other Water Rights

Interference drawdown from operating both wells was conservatively projected to a 100-day continuous operation condition, which is likely the longest continuous pumping that is could be needed to meet a particularly high summer-demand period. Based on water system operations and storage capacity, operation at this peaking amount is expected to be infrequent. Even based on the conservative projection however, minimal drawdown is anticipated to occur to other wells at levels that are not expected to impact their operation.

Effect on Instream Flows

The closest surface-water body to the project site is Woodland Creek. Minimum instream flows for this area were established through Chapter 173-513 Washington Administrative Code (WAC), the Instream Resources Protection Program for the Deschutes River Basin WRIA 13. Under the provisions of the WAC, most of the surface-water bodies in the WRIA are closed to further appropriations. Section 173-513-050 provides that future groundwater withdrawals are not affected by this chapter unless it is verified that such withdrawal would clearly have an adverse impact upon the surface-water system contrary to the intent and objectives of this chapter.

The PUD's wells are completed in a relatively deep, confined aquifer that is separated from overlying shallower aquifers by a fine-grained aquitard that is about 40 feet thick and is continuous throughout the area (Drost and others, 1999[5]). This was confirmed for the vicinity of the PUD by examining driller reports (logs).

There are two aquitards between the source aquifer (Qc) for the PUD wells and the unconfined aquifer (Qvr) that is in continuity with surface waters (see preceding discussion of hydrostratigraphy in the area). Directly overlying are the Qf aquitard, the confined Qva aquifer, the Qvt aquitard, and the unconfined Qvr aquifer.

As demonstrated by the pumping tests of the PUD wells, the source aquifer (Qc) exhibits a small leakage response from the overlying aquitard. This response confirms what would be expected based on the conceptual model of the hydrologic system described by Drost and others (1999). However, since the PUD is not proposing to increase the annual amount of water withdrawn, but only the instantaneous rate over short periods of time, these short-term increases will be dampened by the storage and permeability characteristics of the overlying confining layers. As such, leakage rates will be largely governed by the average long-term pumping rate (Qa) and consequently short-term increases in pumping will not invoke any additional surface water capture. As previously noted the TCPUD's pumping also will capture groundwater that would have discharged to Puget, as indicated by the natural direction of groundwater discharge.

Based on the foregoing, and the analysis above, the additional withdrawal rate for short peak demands will not have an adverse impact on Woodland Creek or the surface water system in WRIA 13.

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[5] The aquitard has been encountered in all of the deeper wells in the area and therefore was interpreted to be present within the area where significant drawdown would be induced by pumping.

Quantities for Permit

The 2009 Water System Plan indicates that the average daily demand (ADD) per connection was 187 gallons per day, however given the high amount of unaccounted for water; the PUD's ADD was 311 gpd/connection.

The PUD projects that with conservation, the total annual demand in 2028 will be in the order of 636 acre-feet per year. Because the PUD currently holds rights in excess of that amount, no additional primary Qa is needed by this system. Therefore, this permit recommends additional instantaneous capacity only.

The PUD is working to reduce overall leakage. In 2012 the PUD supplied 1,784 connections. The system's total ADD was about 268 gallons per day. The PUD is not requesting additional annual (Qa) in this application. Therefore, this Report recommends and provides for additional instantaneous (Qi) capacity only. The 510 gpm requested is reasonable and consistent with the PUD's present and forecasted instantaneous demands and water system planning for peak day usage.

Priority Processing

RCW 90.03.265(2) provides that, in pursuing a cost-reimbursement project, the Department must determine the source of water from which the water is proposed to be diverted or withdrawn, including the boundaries of the area that delimit the source. The Department must determine if any other water-right applications are pending from the same source. A water source may include surface water only, groundwater only, or surface and groundwater together, if the Department finds they are hydraulically connected. The Department shall consider technical information submitted by the applicant in making its determinations under this subsection.

RCW 90.03.265(1)(b) provides that the requirement for an applicant to pay for the processing of senior applications does not apply in situations where the water allocated to one party will <u>not diminish</u> the water available to a senior applicant from the same source. Because there are no other pending groundwater applicants that will be affected by the requested allocation, this application can be processed prior to other pending applications.

Four Statutory Tests

This Report of Examination (ROE) evaluates the application based on the information presented above.

To approve the application, Ecology must issue written findings of fact and determine that each of the following four requirements of RCW 90.03.290 has been satisfied:

1. The proposed appropriation would be put to a beneficial use;
2. Water is available for appropriation;
3. The proposed appropriation would not impair existing water rights; and
4. The proposed appropriation would not be detrimental to the public welfare.

Beneficial Use

According to RCW 90.14.031, municipal supply is considered a beneficial use of water.

Availability

Water is available for appropriation. The aquifer (Sea Level Aquifer) that the applicant intends to tap is highly transmissive and productive and is capable of supporting the additional withdrawals requested.

The quantity appropriated reflects the amount needed to meet the needs of the applicant's intended municipal water use. Water is, therefore, judged to be available for appropriation under existing Ecology regulations.

Potential for Impairment

The approval of this application will not impair existing rights or instream flows within the Woodland Creek basin. A review of Ecology records indicates that, within a half-mile radius of the Tanglewilde wellfield, there are 7 groundwater certificates (2 of which are already associated with this system), and potentially 25 claims recorded for Section 15. Of the certificated water users, the nearest is associated with a well at the Shattuck Trailer Park (north side of Martin Way) that will not experience significant drawdown due to the additional Qi for the Tanglewilde system (see discussion above). The recorded claims were, for the most part, filed for domestic uses. It is not known how many of the water uses represented by claims are still operating; however, this area is now supplied by either the City of Olympia, or the PUD, so it is likely that many domestic users now are served by the utilities. The proposed ground-water withdrawals will not impair existing rights if exercised according to the provisions above. Because this permit will not increase the net amount of water withdrawn from the aquifer and any increases in short-term pumping will be attenuated by an overlying confining layer, there will be no net increase in surface-water capture.

Public Welfare

No detriment to the public interest was identified during the investigation of the subject application.

CONCLUSIONS

The conclusions based on the above investigation are as follow:

1. The proposed appropriation for municipal supply is a beneficial use of water;
2. The requested quantity of 510 gpm, is available for appropriation;
3. The new appropriation will not impair senior water rights; and
4. The new appropriation will not be detrimental to the public interest.

RECOMMENDATION

Based on the information presented above, the author recommends that the request to appropriate 510 gpm be approved in the amounts described, limited, and provisioned on page 1 through 3 of this report.

Report by: Jill E Van Hulle

Jill Van Hulle, Pacific Groundwater Group — Date

Reviewed by: Michael J. Gallagher — 3/18/2014

Michael J. Gallagher, Water Resources Program — Date

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