STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
February 9, 1998	G2-29595		

NAME
Laura E. Thompson (Peninsula Golf Course)

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
P.O. Box 536	Long Beach	Washington	98644

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Nine sand points (wells)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
	198	1.5

QUANTITY, TYPE OF USE, PERIOD OF USE

198 gallons per minute, 1.5 acre-feet per year for irrigation of 2 acres of turf grass from May 1 to October 1.

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL

Starting from the northwest corner of Section 9, approximately:
1) 715 feet east and 960 feet south;
2) 1,700 feet east and 1,100 feet south;
3) 1,440 feet east and 415 feet south;
4) 1,730 feet east and 180 feet south;
5) 1,070 feet east and 65 feet south; and
6) 1,330 feet east and 20 feet north.

And from the southwest corner of Section 4, approximately:
7) 820 feet east and 350 feet north;
8) 650 feet east and 915 feet north; and
9) 870 feet east and 1,030 feet north.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
E1/2, SW1/4, SW1/4	4	10	11 W		
E1/2, NW1/4, NW1/4	9	10	11 W	24	Pacific
W1/2, NE1/4, NE1/4	9	10	11 W		

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
Tax Parcel 10110921230		

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

A portion of Sections 4 and 9, Township 10 North, Range 11 West, Willamette Meridian, more particularly described as follows:

Beginning at a pomt which bears South 88° 35' East, 40.00 feet from the Southeast corner of Block 89 of "Pioneer", now vacated, per plat thereof filed in Volume C of Plats at Page 3, Records of Pacific County, Washington, Thence North 88° 35' West, along the North line of vacated "H" Street, 671.5 feet more or less to a point which bears South 88° 35' East, 88.5 feet from the Southeast Corner of Block 40; Thence Southerly to a point on the South Line of vacated "H" Street which bears South 88° 35', 88.5 feet from the Northeast Corner of Block 41; Thence North 88° 35' West, along the South line of vacated "H" Street, 228.5 feet, more or less to the Southerly extension of the East Line of Stewart Avenue, per the Plat of Breakers, no vacated, as filed in Volume E of Plats at Page 2; Thence North 1° 27' East along the East line of said Stewart Avenue 2310 feet more or less to the North Line of Ninth Street per said Plat of Breakers; Thence South 88° 33' East, 450.0 feet along the North line of Ninth Street; Thence South 1° 27' West, 770.00 feet along the East Line of Kennedy Avenue; Thence South 88° 33' East, 450.0 feet along the North line of Skykomish Street; Thence South 1° 27' West, 325.9 feet along the East line of Lyniff Avenue; Thence South 88° 33' East, 325 feet; Thence South 1° 27' West, 1166.25 feet more or less to a point which lies 325 feet East of the Point of Beginning; Thence West 325 feet to the Point of Beginning.

DESCRIPTION OF PROPOSED WORKS

Laura Thompson, owner of Peninsula Golf Course, has applied for an appropriation of public groundwater from nine existing sand points for use in irrigation of turf grass (tee boxes and greens) for the 9-hole golf course. One sand point is located adjacent to each tee box pairing and green. Groundwater is withdrawn by portable gasoline-powered pumps, each capable of producing approximately 22 gallons per minute. The seasonal irrigation schedule is largely dependant on weather, but is typically May to October. The local annual water duty of turf grass is approximately 0.72 acre-feet/acre (8.60 inches), and the total area of tees and greens to be irrigated is about 2 acres (USDA 2007).

Potable water for the club house facility and on-site residence is supplied by City of Long Beach municipal supply.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Complete	Complete	June 2012

REPORT

BACKGROUND

On February 9, 1998, Laura E. Thompson, owner of the Peninsula Golf Course, filed an Application for Permit (G2-29595) with the Washington State Department of Ecology (Ecology) for a water right permit to appropriate public groundwater. The applicant requested authorization for an instantaneous withdrawal (Qi) of 198 gallons per minute (gpm), with no specified total annual withdrawal volume (Qa).

Planned use of the appropriation is for irrigation of turf grass of the Peninsula Golf Course. Irrigation would be limited primarily to the tee boxes and greens of the 9-hole golf course, which encompass approximately 2 acres in total. The golf course is located on approximately 55 acres.

The project site is located near the southern end of the Long Beach Peninsula, within the state's Water Resource Inventory Area (WRIA) 24. Notice of the application was published in the *Chinook Observer* of Long Beach, Washington, on May 11 and 18, 2005. No protests were received by Ecology.

Based on the provisions of RCW 43.21A.690 and RCW 90.03.265, this application has been processed by Aspect Consulting, LLC (Aspect Consulting) under Ecology Cost-Reimbursement Backfill Assignment No. ASP3 (master contract No. C0500006).

INVESTIGATION

In consideration of this application, Aspect Consulting reviewed available documents pertaining to the application's site conditions, historical water use, projected water demand, and the potential effect on existing water right holders. This included the information submitted by the applicant and pertinent Ecology records including well logs, water rights records, and well construction reports. The review also included reports from multiple investigations detailing the hydrogeology and water quality of the Long Beach Peninsula. Most notably, a 1995 United States Geological Survey (USGS) report, Ground-Water Flow and Water Quality in the Sand Aquifer of Long Beach Peninsula, Washington (Thomas 1995), provided a comprehensive water balance and examined groundwater recharge, movement, and quality along the peninsula. An earlier estimate of the peninsula's water balance and an assessment of groundwater availability were described by Tracy (1977).

A site visit was performed on June 3, 2005. Tyson Carlson of Aspect Consulting visited the site, including inspection of the points of withdrawal and place of use and an interview with the applicant and operator of the golf course.

Pacific County Department of Public Works provided a copy of the Surface Water Management Plan (Pool 1985) describing the peninsula's major drainages and methods of controlling and conveying storm water, surface water, and groundwater. Supplemental data on water quality and groundwater elevations over time were obtained from the Pacific County Department of Community Development.

Using this information, Aspect Consulting evaluated water availability and potential effects of the proposed appropriation upon existing water rights. Each of the four requirements specified in RCW 90.03.290 were individually examined and are presented below.

Project Description

The Application for Permit for Laura E. Thompson (Peninsula Golf Course) seeks authorization to withdraw groundwater from nine sand points. The sand points are located near each tee box pairing and greens, plus a practice green, throughout the 55-acre grounds. The proposed purpose of use is for seasonal irrigation of approximately two acres of turf grass.

Site Description

The proposed points of withdrawal are located approximately one mile north of downtown Long Beach, in the eastern half of the southwest quarter of the southwest quarter of Section 4 and the eastern half of the northwest quarter of the northwest quarter and the western half of the northeast quarter of the northeast quarter of Section 9 in Township 10 North, Range 11 West Willamette Meridian. The points of withdrawal and place of use are located on approximately 55 acres which have been an operational golf course since 1947. Laura E. Thompson has owned the property and business since 1964 and has leased out operation of the facility since 1987.

The nine jetted wells (sand points) were installed by a licensed well driller employed by Taft Plumbing of Ocean Park, Washington. Each wellhead is covered by a small well house containing a manifold for connecting to the pump, hose, and above ground sprinkler. The portable 4.0 to 5.5 horsepower gasoline-powered pumps, stationed at each tee box pairing and adjacent green, are capable of approximately 22 gpm. In addition, a small electric pump withdraws water from an adjacent sand point and supplies water to the practice green and ornamental landscaping around the club house. Several sand points have been replaced over the years following sanding problems or low yield. Each sand point is completed to approximately 20 feet below ground surface.

Seasonal irrigation of the tee boxes and greens usually occurs in the mornings, as local precipitation patterns dictate. Each pump is manually cycled on, each operating for approximately 15 minutes to as much as 1 hour during peak season (July-August), 5-6 days a week. Due to logistics and physical separation of the sand points, it is rare for all nine pumps to be operating at the same time.

Hydrogeologic/Hydrologic Assessment

The Long Beach Peninsula is located in the southwest corner of Washington State, just north of the Columbia River delta. Approximately 27 miles long with an average width of 1.5 miles, the Long Beach Peninsula is surrounded by seawater on three sides. The surface topography is the result of a series of north-south trending sand dunes. Interior surface elevations are typically 25 feet above mean sea level (MSL), but can reach upward of 50 to 70 feet MSL on foredune features found in the northwestern part of the peninsula. The average annual precipitation is 80 inches/year over a 40-year record (1954 to 1992).

The geology of the Long Beach Peninsula is dominated by the depositional environment created by longshore currents transporting sediment, predominantly from the Columbia River, along the Washington coast. Over thousands of years, several hundred feet of unconsolidated sediment have accumulated to shape the peninsula. The thickness of these deposits increases from south to north, as the underlying basal bedrock dips away from its surface outcropping south of Seaview, eventually reaching thicknesses of 1,400 feet toward the northern end of the peninsula. Although the peninsula hosts a widely heterogeneous mixture of unconsolidated sediment (reflecting the ever-changing depositional environment), the upper 100 feet is dominated by sand, underlain by a series of discontinuous lenses of sand and silt/clay.

Groundwater on the Long Beach Peninsula primarily occurs as a lens of fresh water atop saline water from the flanking Pacific Ocean and Willapa Bay. The USGS refers to this fresh water lens as the "sand aquifer", which is a water table aquifer with depth to water typically less than 10 feet below ground surface (depending on surface elevation). Groundwater movement within the sand aquifer is typically perpendicular to the length of the Long Beach Peninsula, from the peninsula axis to the east and west. The actual location of the groundwater divide between eastward- and westward-flowing groundwater is slightly offset to the Pacific side (west), resulting in a greater volume of groundwater discharge to Wallapa Bay than to the Pacific Ocean. The silt/clay lenses may locally act as confining units restricting vertical groundwater movement in some areas, but the USGS did not document any regionally continuous confining layer within the sand aquifer (Thomas 1995). A generalized cross section of the Long Beach Peninsula is presented in Figure 1, adapted from Thomas (1995).

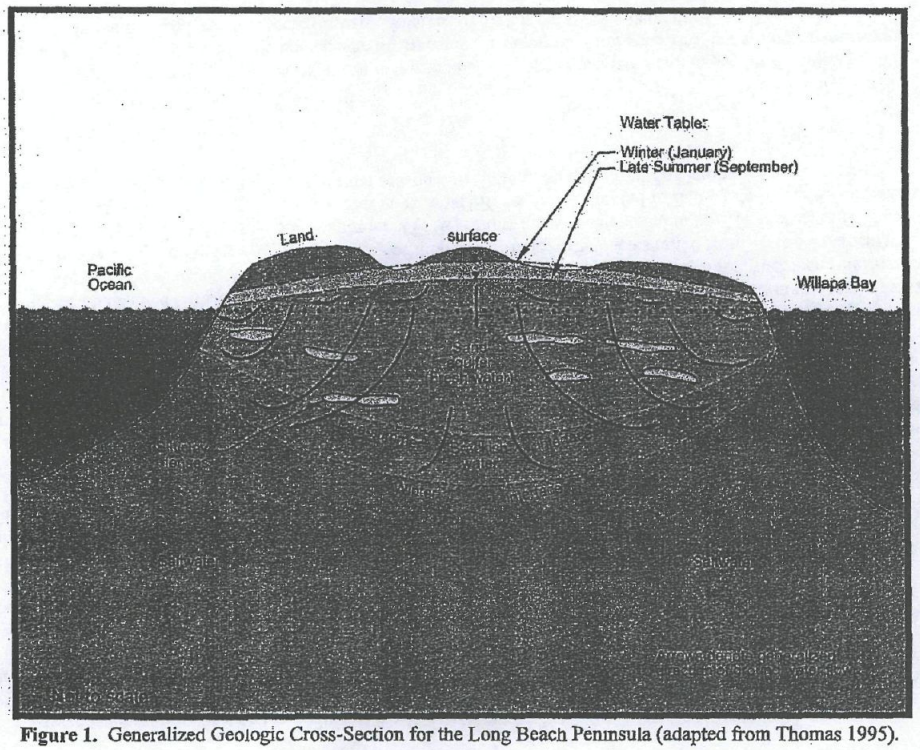


Figure 1. Generalized Geologic Cross-Section for the Long Beach Peninsula (adapted from Thomas 1995).

Surface water occurs in topographic lows, primarily in troughs between dune features. Typically an expression of shallow groundwater, surface water features generally follow a north-south drainage pattern except where altered by man-made canals, drainage ditches, or culverts. There are no instream flow or lake level minimums defined for surface water bodies on the peninsula or anywhere within WRIA 24.

Hydraulic continuity between surface waters and the shallow sand aquifer is well documented. Thomas (1995) compared groundwater and surface water elevations near eight major drainage channels along the peninsula. In 75 percent of the measurements, groundwater elevations were higher than the adjacent surface water body – indicating groundwater discharge to surface water. For the period of one month (January 1992), an estimated 7,700 acre-feet of groundwater discharged to surface waters across the peninsula. The same analysis suggests that from June through September, when groundwater elevations are at their lowest, there is no net groundwater discharge to surface water – indicating a net losing surface water condition. Thomas (1995) states that many of the lakes and marshes have thick deposits of low permeability organic sediment along their bottoms, but hydraulic continuity with surrounding groundwater is maintained through the lakes' upper margins where less of the low permeability material has accumulated.

Pacific County's Surface Water Management Plan (Pool 1985) illustrates the major drainages of the peninsula and describes methods for controlling stormwater, surface water, and groundwater. Historically, the peninsula has been plagued with numerous flooding problems associated with the transmission of surface water runoff to the receiving water bodies. These problems are typically associated with seasonal and long-term flooding and insufficient retention capacity. Solutions to these problems have included construction of primary drainage courses, periodic maintenance to reopen clogged drainage courses, and improvement/installation of control structures, outfalls, and tide gates (Pool 1985).

The East Main Drainage Ditch collects water from approximately 1,800 acres before discharging to the Willapa Bay. The extent of the drainage basin roughly corresponds with Pacific Avenue (Highway 103) to the west, then east to the topographic high near the center line of the peninsula. Surface water drains south from an area north of Cranberry Road and north from 68th Place, converging to the drainage ditch that transects the Peninsula Golf Course, continuing southeast, then parallels 95th Street directly east to Willapa Bay. The East Main and Tarlatt Slough drainages share a common delta to Willapa Bay. Water discharged through the East Main Drainage Ditch is predominately stormwater runoff, although a percentage of flow is certainly groundwater seepage.

In addition to the East Main Drainage Ditch, other significant surface water bodies in proximity to the proposed point(s) of withdrawal include Breaker Lake, located immediately east of the golf course, Briscoe and Deer Lake, as well as other numerous small named and unnamed lakes and ponds.

Long Beach Peninsula Water Balance

The Long Beach Peninsula exhibits a classic maritime climate – temperate year-around temperatures with 75 percent of the annual rainfall occurring between October and March. The high infiltration capacity of the surface soils affords an estimated 58 inches of recharge annually, equating to an estimated 111,000 acre-feet/year across the entire peninsula (Thomas 1995). The thickness of the groundwater lens in the sand aquifer fluctuates seasonally with precipitation. Precipitation is the sole source of aquifer recharge, with peak groundwater elevations of approximately 15 feet above MSL and the seasonal low of approximately 10 feet MSL (Thomas 1995). The Ghyben-Herzberg principle (Freeze 1979) states that a 1-foot change in fresh water elevation above sea level results in a 40-foot change (opposite direction) in the elevation of the fresh water/saline water interface below sea level. Application of this principle implies that the freshwater lens can approach 400 to 600 feet thick near the center line of the peninsula. The thickness of the freshwater lens will decrease (at a theoretical ratio of 40:1) with distance east and west from the groundwater divide in the peninsula center as the aquifer head decreases toward sea level.

As of 1992, groundwater withdrawals on the peninsula were classified into five categories (Thomas 1995): public supply, domestic supply, irrigation, livestock, and cranberry processing. Approximately 90 percent of the potable water supply on the peninsula comes from large water purveyors, with the remaining 10 percent originating from shallow privately owned wells. In 1992, the total annual volume of groundwater withdrawn for public and domestic supply was approximately 775 acre-feet. Comparatively, groundwater withdrawals for irrigation, livestock, and cranberry processing were relatively minor at 7.7, 0.6, and about 1.0 acre-feet, respectively. Cumulatively, the total groundwater withdrawals for 1992 accounted for approximately 782 acre-feet.

Demands for freshwater on the Long Beach Peninsula are highly seasonal. In 1992, the flux of summer tourists nearly doubled the population of the peninsula, increasing the average monthly water usage from 55 acre-feet per month to over 100 acre-feet per month (Thomas 1995). Similarly, the irrigation season for turf and cranberry bogs primarily occurs during the summer months, immediately followed by the acute water requirements for cranberry harvest and processing in early Fall as detailed above.

Thomas (1992) reported estimates of water use for irrigation of the Peninsula Golf Course. Approximately 2,440,000 gallons (7.5 acre-feet) of groundwater was used (May to September) in 1992. The quantity was estimated assuming 5 acres of irrigable land and 1.5 acre-foot/acre of water per irrigation season. Groundwater use during peak periods was estimated at 1,460,000 gallons (4.5 acre-feet) and 980,000 gallons (3.0 acre-feet) during the low-use periods.

The Appendix B of the State of Washington Irrigation Guide (USDA 2007) reports crop irrigation requirements (CIR) for major weather stations around the State. The CIR is defined as the amount of water required to satisfy evapotranspiration that is not provided by water stored in the soil or by precipitation. The CIR for pasture/turf is 6.88 inches per irrigation season for Aberdeen (the nearest station to the Long Beach Peninsula). Assuming an average efficiency of 80 percent (note: efficiencies range from 75 to 90 percent) for an impact sprinkler head with end gun, the total irrigation requirement (TIR) of turf grass is calculated to be 8.60 inches, or 0.72 acre-foot/acre, per irrigation season (TIR = CIR/efficiency). This calculation uses the efficiencies presented in Ecology's Water Resources Program Guidance GUID-1210. The irrigation guide defines the seasonal irrigation season as May to October.

Long-Term Trends in Water Levels and Water Quality

Thomas (1995) determined that elevated dissolved iron in the sand aquifer is the primary drinking water quality issue on the peninsula. Groundwater quality did not appear to have been adversely impacted from agricultural activities, but some above-background nitrate concentrations attributed to septic systems were observed in areas of higher population density.

Thomas (1995) also found that there has been no substantive change in groundwater quantity or quality in the sand aquifer between the early 1970s and 1992. Groundwater levels were stable between 1974 and 1992; chloride concentrations and specific conductance values (indicators of saline water intrusion) were also stable between 1968 and 1992. In general, groundwater quality of the Long Beach Peninsula is good, although localized elevated concentrations of iron have been reported (approximately 30 percent of water samples exceed the 0.3 mg/L state secondary maximum contaminant level based on aesthetics). However, no significant problems due to groundwater withdrawals, agricultural activities, or septic were identified.

Since the USGS study was published in 1995, Pacific County Department of Community Development has been collecting groundwater quality data from a 24 monitoring well network along the entire Long Beach Peninsula. Pacific County's more recent data from the immediate area of the subject application do not indicate water quality impacts, based on measured chloride or nitrate levels, or a discernable change in groundwater elevations. In the 24 well network, reported chloride concentrations ranged from 0.3 mg/L to 99.2 mg/L (excluding one anomalous well, No. 98, which had only one reported reading equal to 290 mg/L) and a average chloride concentration of 16 mg/L.

APPLICATION EVALUATION

This Report of Examination (ROE) evaluates the application based on the conceptual model 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.

This ROE addresses these subjects in the above referenced order. Fulfillment of the four requirements determines the decision of Ecology.

Source of Water Proposed for Appropriation

The applicant seeks to withdraw water from up to nine sand points located in the eastern half of the southwest quarter of the southwest quarter of Section 4 and the eastern half of the northwest quarter of the northwest quarter and the western half of the northeast quarter of the northeast quarter of Section 9 in Township 10 North, Range 11 West Willamette Meridian. The hydrogeologic regime of the Long Beach Peninsula is analogous to that of an island, with precipitation infiltrating on the uplands, recharging the sand aquifer, and flowing laterally within the aquifer to discharge to seawater at the marine boundaries. No regionally extensive confining unit has been identified to indicate distinct aquifer zones within the sand aquifer, i.e., the sand aquifer is considered a single continuous aquifer system beneath the entire peninsula and to the maximum depth of fresh water occurrence. Surface water bodies on the peninsula are typically an expression of the water table in the sand aquifer; however, surface water features may become perched as groundwater elevations seasonally decline.

In view of the hydraulic continuity linking surface water and groundwater and by virtue of their shared source of recharge, we consider that the source of water proposed for appropriation in this application comprises the entire hydrologic system described above (the sand aquifer, which expresses itself as surface water features in low lying areas). Consequently, all of the senior water right applications (based on priority date) are competing for the same source of water - inclusive of surface water and groundwater across the entire length of the Long Beach peninsula.

Beneficial Use

In accordance with RCW 90.54.020(1), the proposed appropriation for irrigation of turf grass represents a beneficial use of water. As detailed on the Application for Permit, the points of withdrawal are supported by the necessary infrastructure to deliver water to approximately 2 acres – nine greens, one practice green, and 18 tee boxes. The water would be used at rates consistent with standard practice for the industry, subject to seasonal weather patterns.

Availability

No administrative or regulatory closures are identified that affect the availability of water requested under this application. The shallow sand aquifer is the most widely used source for groundwater on the Long Beach Peninsula and it is relatively well understood with respect to its water balance. Based on 1992 data, the USGS estimated that groundwater withdrawal from the sand aquifer across the peninsula is approximately 780 acre-feet/year, or 0.7 percent of the aquifer's annual recharge (111,000 acre-feet/year; Thomas 1995). Although highly sensitive to precipitation and seasonality, long-term water level trends in the aquifer have been evaluated in a number of detailed investigations. In the most recent assessment, Thomas (1995) concluded there are no discernable trends to water levels or water quality indicators of saltwater intrusion over the 20 to 25 years preceding 1992. Tracy (1977) estimated that approximately 12 inches of water was available for appropriation, roughly equivalent to 600 gpm or 960 afy per mile of peninsula length.

Outside of the current Backfill project, no new water rights have been issued by Ecology since the time of the USGS' assessment; therefore, we expect little change to the hydrologic situation they documented. This is substantiated by more recent data collected by the Pacific County Department of Community Development and is consistent with the limited pumping stress on the sand aquifer relative to the annual recharge.

Neither Ms. Thompson nor the current operator indicated problems with obtaining ample irrigation water for the Peninsula Golf Course. In fact, the golf course routinely floods as storm water seasonally inundates much of the low-lying areas of the peninsula. The source of the flooding is spillover from the East Main Drainage Ditch which transects the golf course and neighboring Breaker Lake. In addition, the East Main Drainage Ditch is routinely blocked by local cranberry growers to increase water storage in anticipation of summer harvest.

Based on the collective information, we conclude that the quantity of water requested for use in this application is available for appropriation.

Potential for Impairment

RCW 90.03.290 requires a determination that a new appropriation will not impair existing rights. Based on the results of the distance-drawdown analysis presented below, consideration of permits, certificates, and claims within a 0.5-mile radius of the proposed withdrawal was considered conservatively inclusive of all potentially affected senior rights. Eight water right permits and certificates lie within 0.5 mile of the subject application's proposed point(s) of withdrawal. Five of these water rights are groundwater rights and three are surface water rights. The water rights vary in quantity and utilize either surface water or the shallow sand aquifer. Table 1 lists the water rights and describes the water quantities allocated as well as the location of use.

Water Right Number	Name	Purpose	Priority Date	Qi		Qa in afy	Point of Diversion/Withdrawal
G2-65028JWRIS	Brateng, N.I. & M.E.	ST,DS	1/1/1916	9	gpm	1	T10N R11W Section 9
G2-65012JWRIS	University Of Washington	DS,DG	1/1/1923	9	gpm	1	T10N R11W Section 9
G2-*05882CWRIS	Brateng, N.	IR	3/22/1961	800	gpm	16	T10N R11W Section 9
S2-*03436AMCWRIS	Western Cranberry Co.	IR	6/29/1931	3	cfs	0	T10N R11W Section 9
G2-*03338CWRIS	Richardson, J.	IR	8/14/1953	150	gpm	6	T10N R11W Section 9
G2-21225CWRIS	Ocean View Convalescent Center	IR	7/2/1973	20	gpm	2	T10N R11W Section 9
S2-CCVOL3P1145	Brateng, N.	IR	6/29/1931	3	cfs	0	T10N R11W Section 9
S2-28277	Weyl, Robert	IR,FP	9/4/1991	0.9	cfs	28.5	T10N R11W Section 9

Table 1. Water Right Permits and Certificates within a 0.5 Mile Radius of Proposed Points of Withdrawal.

In addition, a total of 65 claims to vested water rights were identified in an area of 0.5-mile radius from the proposed point(s) of withdrawal.

The location of the point(s) of withdrawal is located near the groundwater divide running along the north-south axis of the peninsula (Thomas 1995) – at the thickest part of the fresh groundwater lens. At the divide, the fresh water lens thickness is estimated to seasonally fluctuate hundreds of feet. Due to the great thickness of the fresh water lens, withdrawal of shallow groundwater from near the groundwater divide is not likely to significantly impact the cumulative thickness of the fresh water lens. Any change in head caused by the withdrawal is not likely to be discernable relative to the seasonal groundwater fluctuations. If seawater intrusion were a concern, it would most likely manifest itself as upconing – a phenomena occurring when the thickness of the fresh water lens is not adequate to

support the pumping stress from a pumped well, thus causing deep saline water to migrate upward into the fresh water lens. In other words, one foot of drawdown of the water table theoretically results in 40-foot upwelling of the fresh water/saline water interface at depth. Deeper wells are at greater risk of impairment by saline upconing than shallower wells. Review of the Ecology well log database indicates that the deepest well within a 0.5 mile radius of the proposed withdrawal is 24 feet below ground surface. Even during the late summer - when groundwater levels are at their lowest – we estimate that more than 350 feet of fresh groundwater would still remain at the point of maximum water table drawdown. This thickness should be more than adequate to prevent saline water upconing from impairing neighboring senior wells.

In addition to certificated, permitted, and claims to water rights, there are a number of exempt wells in a 0.5-mile radius from the proposed points of withdrawal. The Ecology database was queried for well logs within a 0.5-mile radius of the subject application, resulting in eight possible exempt water supply wells (excluding three resource protection wells). As mentioned above, a review of the well logs for these wells indicated that all of the wells are completed at a depth less than 25 feet. Impairment of these exempt wells due to upconing or lateral intrusion of saline water is not expected to occur.

The points of withdrawal may be theoretically evaluated using several different assumptions. First, the influence of a single sand point can be calculated using the governing Theis equation (Theis 1935) for radial flow to a well, assuming an average pumping rate of 22 gpm. Second, the impact of the entire appropriation can be modeled as a single extraction well pumping at 198 gpm (9 wells simultaneously pumping at 22 gpm). Based on these assumptions, after 8 hours of pumping, no discernable (greater than 0.01 foot) drawdown is calculated to occur further than a 115 foot radius from any one sand point, or 160 feet assuming a single cumulative withdrawal. The calculations assume the average hydraulic parameters for the sand aquifer presented in Thomas (1995).

This well interference analysis is considered worst case. Sand points are spread out over the 55 acres, often spaced further than the 115 feet radius of influence. Also, irrigation only occurs for 15 minutes to 1 hour in the morning, up to 5-6 days a week during peak use, but is not likely to exceed eight hours in any one day (from all nine sand points simultaneously).

Nearly all of the water rights within a 0.5-mile radius of the subject application are withdrawing from surface water bodies, drainage channels, or from the sand aquifer - all of which are in close hydraulic connection with the point(s) of withdrawal. In addition, the subject applicant has reportedly been withdrawing groundwater for the irrigation of turf grass for 60 years and no adverse impacts from neighboring water right holders have been reported during that period.

Based on the collective information, impairment of existing rights is not anticipated with full use of the requested quantity.

Public Welfare
The proposed appropriation will support the recreational economy of the area, and no detriment to the public welfare was identified.

CONCLUSIONS

The conclusions based on the above investigation are as follow:

1. The proposed appropriation for turf grass irrigation is a beneficial use of water.
2. The quantity of water requested for use in this application is available for appropriation. On a per-acre basis, an estimated 0.72 acre-feet of water is required annually for the irrigation of turf grass – May to October, as needed. Therefore, 1.5 acre feet of water will satisfy the needs of the applicant to irrigate 2 acres.
3. The proposed appropriation will not impair senior water rights.
4. The proposed appropriation will not be detrimental to the public interest.

RECOMMENDATION

I recommend approval of application G2-29595 and issuance of a permit to allow appropriation of groundwater from the nine sand points at a combined maximum instantaneous withdrawal rate of 198 gpm and total annual withdrawal of 1.5 acre-feet per year for the seasonal irrigation of two acres of turf grass. The period of use will be annually May 1 to October 1, as needed.

The amount of water granted is a maximum limit that shall not be exceeded and the water user shall be entitled only to that amount of water within the specified limit that is beneficially used and required.

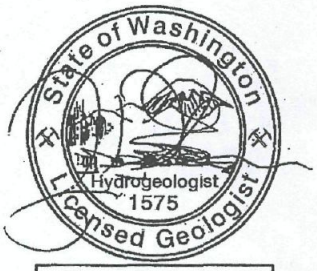
The permit shall be subject to existing rights and the following provisions:

1. The applicant is advised that the quantity of water allocated by this permit may be reduced at the time of final certification to reflect system capacity and actual usage.

   A certificate of water right will not be issued until a final investigation is made.

2. An approved measuring device shall be installed and maintained for each diversion/withdrawal of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use," Chapter 173-173 WAC.

   Water use data shall be recorded annually and maintained by the property owner for a minimum of five years, and shall be promptly submitted to the Department of Ecology upon request.



REPORT BY: Tyson D. Carlson Date: October 22, 2007
Tyson D. Carlson

REVIEWED BY: Phil Crane Date: 10/22/07
Phil Crane

FINDINGS OF FACT AND DECISION

Upon reviewing the above report, I find all facts, relevant and material to the subject application, have been thoroughly investigated. Furthermore, I find water is available for appropriation and the appropriation as recommended is a beneficial use and will not be detrimental to existing rights or the public welfare.

Therefore, I ORDER a permit be issued under Ground Water Application Number G2-29595, subject to existing rights and indicated provisions, to allow appropriation of public ground water for the amount and uses specified in the foregoing report.

Signed at Olympia, Washington, this 23rd day of October, 2007.

Tom Loranger

Tom Loranger
Water Resources Supervisor
Southwest Regional Office

CITATIONS

Dickey, Brian, 2005. Pacific County Department of Community Development. Personal communication and groundwater monitoring data. Long Beach Peninsula, Washington.

Ebbert, J.C. and K.L. Payne, 1985. The Quality of Water in the Principal Aquifers of Southwestern Washington. USGS Water Resources Investigation Report 84-4093.

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