



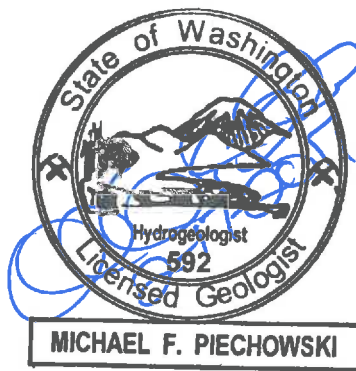
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JULIANN AND PAT SULLIVAN
HYDROGEOLOGIC ASSESSMENT
15712 28TH AVENUE NORTHWEST
PIERCE COUNTY PARCEL 0222171053

FEBRUARY, 2017

by

Michael F. Piechowski, LHG
Principal Hydrogeologist



Pat and Juli Sullivan
Pierce County Parcel 0222171053
15712 28th Avenue Northwest
Hydrogeologic Assessment
February 17, 2017

Introduction and Scope

This assessment has been prepared for Pat and Juli Sullivan to meet the requirements stated in Pierce County Policy Number DW2016-02, which requires a hydrogeologic assessment to determine if the proposed exempt well for a building project “impacts or impairs a senior water rights holder, and impacts or impairs established instream flows and closures as identified by the State.” This policy is applicable in certain areas of Pierce County including portions of the Kitsap Watershed (WRIA 15). The site is located within the Crescent Valley drainage, an area that is seasonally closed to surface water appropriations, so it is included in this policy.

The site is located on the western side of 28th Avenue NW, north of Gig Harbor, Washington in unincorporated Pierce County. This area is within the Kitsap Watershed. The street address is 15712 28th Ave. NW, the Pierce County tax parcel number is 0222171053. The surrounding properties are generally developed with single-family residences on large lots. Figure 1 presents a site map, including the boundaries of the parcel and the location of wells evaluated for this assessment.

We understand that the proposed project involves the construction of a three-bedroom single-family residence to be served by an individual well and septic system. We reviewed a provided plat plan, wetland delineation report, and septic design for the proposed project. The proposed well is located on the parcel such that the 100-foot sanitary control radius does not overlap the planned septic drainfield or reserve area. The sanitary control radius does extend onto the neighboring property to the east, but a signed affidavit from that landowner has been filed with the County, so no well variance is required.

Site Setting and Topography

The site is located in the in the Crescent Valley area, on an upland above Crescent Lake, the source of Crescent Creek. The upland has an undulatory surface that was sculpted by the most recent continental glaciation. The features in this area generally trend from the north-northeast to the south-southwest, with lineations corresponding to the presumed direction of glacial motion. The property has a rectangular shape, 325 feet in a north-south direction, and 650 feet in an east-west direction. According to the USGS topographic quadrangle of the area, the site has an elevation of approximately 355 feet along the eastern margin, then with a gentle drop to 345 feet approximately 1/3 to the way to the western margin, then the elevation rises to 370 feet at the western margin.

We recently visited the site. No standing water was observed on the eastern portion of property, nor was any standing water observed in septic test pits on the property. The site is covered with mature trees, a mix of coniferous (Douglas fir, western red cedar, and hemlock) and

deciduous (red alder and big-leaf maple). The understory was fairly clear, though some salal and blackberry were observed. At the time of our site visit, the home site and a portion of the proposed drainfield were partially cleared and the home location staked out. It may be necessary to remove additional trees within the footprint of the home, driveway, and septic drainfield to develop the property as planned.

General drainage patterns in the area follow the local topography. The upland containing the property generally slopes to the southeast, and the site is situated across a slight valley that drains to the south, so surficial drainage generally flows to the south towards Crescent Lake and Crescent Creek.

Surface Water

The site is located in Water Resource Inventory Area 15, specifically within the Crescent Creek basin. The local surface water drainage is towards the south. The nearest significant surface water is Crescent Lake, approximately 3,200 feet to the southeast. The nearest significant surface stream is Crescent Creek which is approximately 4,500 feet to the south of the property, though the USGS quadrangle shows a small tributary creek to Crescent Lake beginning approximately 2,000 feet directly south of the property. During periods of significant runoff, it is likely this small creek has an ephemeral appearance on the property. Crescent Creek flows out of Crescent Lake toward the south and discharges into Puget Sound at Gig Harbor.

Soils and Vegetation

The five-acre site is mostly covered with the Harstine gravelly ash sandy loam with 6 to 15 percent slopes, a small portion of the site near the western boundary has steeper slopes (US Department of Agriculture, Soil Conservation Service). The Harstine loam is a moderately well-drained soil. It forms on the top of sandy glacial drift and generally contains volcanic ash. This soil is considered to be a part of Hydrologic Group C and is not considered a hydric soil. Our observations of the material on site are consistent with the soil survey data; we observed a tan to brown gravelly, sandy silty loam with occasional larger cobbles. Soils information is presented in Appendix A.

Site Geology

Site geology was determined by reviewing published geologic maps of the region. Booth and Troost (2005) map the site and surrounding area as the Vashon till, which is a highly-compacted mixture of sand, gravel, silt and clay that was deposited beneath and overridden by the latest continental glaciation. Typically, till has a relatively low permeability, though it may vary locally based on the composition and the degree of compaction. Review of nearby water well reports suggests that the till is generally over 50 feet thick in the area.

Conceptual Hydrogeologic Understanding

To better understand the relationships between aquifers, confining units, groundwater, and surface water features, we developed a conceptual model of the study area. The site is located on the eastern margin of the glaciated upland that forms the Kitsap Peninsula. Puget Sound borders the peninsula to the east, south, and southwest, and glaciated upland plains extend to the north and west towards Sinclair Inlet and Hood Canal, respectively.

The top of the upland is capped with the Vashon till, which forms a relatively low-permeability confining unit. A thin veneer of Vashon outwash deposits may be locally present over the top of the till, but in the vicinity of the site, the till is present at the surface. Geologic maps and well

logs suggest the thickness of the till is at least 90 feet in the vicinity of the site. The till surface is gently rolling; there are lineations that trend north-northeast to the south-southwest, corresponding to the presumed direction of glacial motion.

The Vashon advance outwash (Qva) sand is present beneath the till. Pre-Vashon deposits are not specifically named in Welch (2014) or Booth and Troost (2005), but rather are described texturally. For the purposes of this study, the descriptions in Welch will be used, with no discussion of deposits deeper than the sea level Aquifer (QA1), as the deepest wells reviewed do not even reach sea level. The unconsolidated sediments in this portion of Pierce County exceed 1,000 feet thick.

The first principal aquifer in the region is a confined aquifer formed in the Vashon advance outwash sand. The Vashon advance outwash sand is well-sorted sand with occasional gravel; it may also contain silty zones. While it may be unconfined, a review of well logs completed within the advance sand suggest that it is fully saturated in this area, and therefore, is confined in this area. Its thickness ranges from 20 to 240 feet, averaging 85 feet in the Kitsap Peninsula area (Welch, 2014).

Well logs from the area around the property indicate the Vashon advance outwash generally has two zones of sand and gravel separated by silty zone (clay is sometimes described as well, though the presence of true clay in Vashon outwash sediments should be limited). It appears most well require drilling into the deeper zone to find an adequate supply.

A deeper aquifer also exists in the area. Welch identifies this deeper aquifer the sea level aquifer (QA1) (Welch, 2014). Typically, it is separated from the advance sands by a thick clay or silt. The aquifer material is typically described as water-bearing sand, occasionally having some gravel.

The Vashon advance outwash is exposed at lower elevations where valleys have been eroded through the till. The valley containing Crescent Lake and Crescent Creek have significant outcrops of the Vashon advance outwash. Spring discharge and seepage is common along the walls of these valleys. The valleys floors are covered with the Vashon recessional outwash, which is a coarser sand and gravel deposited by glacial meltwater as the glaciers retreated.

As the aquifer deposits within the Vashon advance outwash and the QA1 have a significant regional extent in this watershed, recharge to the aquifers results from the infiltration of precipitation throughout the region, and gradients tend to be regionally influenced. The general flow direction within the Qva aquifer is towards the south in the vicinity of the site. The flow in the QA1 aquifer is southeasterly toward Colvos Passage (Welch, 2014).

Though some water undoubtedly runs off the upland via surface drainage, a significant portion infiltrates where slopes are not extreme or where it is captured in depressions. A portion of this water discharges as spring flow along the valley walls, but some fraction infiltrates deeper and is the fundamental mechanism for aquifer recharge. Based on the observed head relationship between the noted aquifer zones, some portion of the water in the shallower zone infiltrates and provides recharge to the deeper aquifer systems evaluated.

The discharge points for the shallow Qva aquifer include springs and seepage along the valley containing Crescent Lake and Crescent Creek to the south of the property and to Colvos Passage coastline to the east. The site straddles a small valley within the upland, so surficial runoff and shallow groundwater are presumed to also flow in a southerly direction towards Crescent Lake and Crescent Creek. Given the relative elevations, there isn't a local discharge point for

the QA1 aquifer system. Based on groundwater flow information presented in Welch and our regional understanding of groundwater flow, the QA1 aquifer generally flows in east-southeast-erly and discharges in Colvos Passage (Welch, 2014).

Well Analysis

As described above, there are several aquifers in the region that supply water to domestic wells. We reviewed well logs in the vicinity of the proposed project, geocoding the well locations to the degree possible given the information on the water well reports. We also evaluated the stratigraphic logs and well completion information to determine depths and type of aquifer present near this location.

Well depths in the vicinity range from 53 to 218 feet deep. Of the 39 wells evaluated for this study, 14 are located within 1,500 feet of the proposed well. These were analyzed further, and the logs of these wells are included in Appendix B. Of these, 3 are completed at approximately 55 feet deep and 3 are completed at around 100 feet; these are all completed in the Qva aquifer. The remaining 6 are completed in the deep QA1 aquifer, found at 170 feet. The depths to water are typically 20 to 50 in the shallow aquifer and around 90 feet in the deeper system. This increasing depth to water (decreasing head with increasing depth) indicates that this area is an aquifer recharge area.

We calculated aquifer characteristics using the pumping test information recorded on the logs following the methods described in Welch (2014). When the water well report included information from a pump or bailer test, we calculated aquifer transmissivity via the modified Theis formula presented in Ferris (1962). In cases where the well was tested with an air test, we used the equation developed by Bear (1979) to calculate a hydraulic conductivity for the aquifer material, then calculated aquifer transmissivity by multiplying the calculated hydraulic conductivity by the thickness of the water-bearing deposit. Aquifer parameters were tabulated, then averaged. At this location, it is apparent that two separate aquifer zones are present, so we calculated average values for each aquifer.

Table 1: Wells within 1,500 feet

Well ID	Tag	Radial Distance (ft)	Depth (ft)	Depth to Water (ft)	Aquifer Zone	Theis Transmissivity (gpd/ft)	Bear Transmissivity (gpd/ft)
358079	ABA-064	250	102	65	Qva	679	
55131	ABP-815	390	178	107	QA1	1490	
55134	ABP-828	460	119	72	Qva	5580	
509961	BAT-439	540	148	83	QA1	1042	
1568113	BIY-098	680	98	40	Qva	1931	
1568407	BJN-278	820	151	74	QA1	1051	
511663	APR-640	890	160	108	QA1	2297	
43804		920	90	45	Qva	2988	
47822		1030	86	46	Qva	863	
52826		1060	53	20	Qva	2097	
583877	ABG-626	1065	53	22	Qva		2513
48908		1120	161	90	QA1	3621	

Well ID	Tag	Radial Distance (ft)	Depth (ft)	Depth to Water (ft)	Aquifer Zone	Theis Transmissivity (gpd/ft)	Bear Transmissivity (gpd/ft)
360212	AGE-533	1480	218	92.5	QA1	568	
48966		1490	63	25	Qva	1117	

The shallow aquifer transmissivity values average approximately 2,100 gallons per day per foot of aquifer width (gpd/ft), though wells in the shallower portion of the aquifer show a slightly smaller transmissivity at about 1,900 gpd/ft and those in the deeper portion a slightly higher value averaging around 2,400 gpd/ft. The deep aquifer has an average transmissivity of about 1,700 gpd/ft.

Using these values, we evaluated the potential for the new well to impair existing wells by calculating the interference drawdown for each of the neighboring wells as a result of the proposed new well. The Theis equation (Theis, 1935) for calculating steady-state drawdown at a radial distance was used, though due to the scarcity of data, we relied upon an assumed storage coefficient of 0.0001, as used by Welch (2014), which, though conservative, is an appropriate value for confined sand and gravel aquifer materials.

We selected a pumping rate based on information tabulated in Welch (2014). The evaluation of 27 years of water use in the Kitsap Peninsula indicates that indoor use averages 66 gallons per day (gpd) per person. Outdoor use ranges from 0 to a maximum of 97 gpd per person depending on the month, and we calculated an average of 61 gpd for the 6-month growing season (May through October). The US Census calculated an average of 2.65 persons per household in Pierce County, so the per-person water use numbers were multiplied by this amount. These calculations indicate an indoor water use, growing-season outdoor water use, and total water use of 175, 162, and 337 gpd, respectively. These values are approximately double those presented in Culhane and Nazy (2015) and Golder (2013), but were used to complete a conservative analysis. Culhane and Nazy (2015) state that indoor use is only 10% consumptive, the remaining 90% is returned via septic infiltration, and that residential outdoor use is considered to be 80% consumptive, with 20% returned via infiltration. Other sources, such as Savoca (2010) suggest outdoor return flow can be as high as 40%. To stay conservative in our approach, we used the 80% consumptive value.

A rate of 337 gpd was selected to calculate the potential for impact during the highest-use period. Under steady-state conditions, this equates to slightly more than 0.2 gallons per minute (gpm). Using the equations presented in Theis (1935), we calculated the predicted drawdowns at each of the wells within 1,000 feet of the proposed well after 184 days (May – October) of continuous pumping, representing the conditions at the end of the summer season.

Table 2: Predicted drawdown after 100 days of pumping

Well ID	Tag	Radial Distance (ft.)	Aquifer	Predicted Drawdown (ft.)
358079	ABA-064	250	Qva	0.11
55131	ABP-815	390	QA1	0.14
55134	ABP-828	460	Qva	0.10
509961	BAT-439	540	QA1	0.13
1568113	BIY-098	680	Qva	0.09

Well ID	Tag	Radial Distance (ft.)	Aquifer	Predicted Drawdown (ft.)
1568407	BJN-278	820	QA1	0.12
511663	APR-640	890	QA1	0.11
43804		920	Qva	0.08
47822		1030	Qva	0.08
52826		1060	Qva	0.10
583877	ABG-626	1065	Qva	0.10
48908		1120	QA1	0.11
360212	AGE-533	1480	QA1	0.10
48966		1490	Qva	0.09

The nearest well in the upper portion of the Qva aquifer is 1,060 feet away. The conservative 184-day prediction results in 0.10 feet of drawdown at this radial distance, which does not represent an impairment in a well with over 30 feet of available drawdown. The nearest well in the deeper portion of the Qva aquifer is 250 feet away. A similar calculation predicts a drawdown of 0.11 feet. Similarly, this does not represent an impairment, as wells completed in the deeper portion of the Qva typically have over 50 feet of drawdown available. The nearest well in the deep QA1 aquifer is 390 feet away. The predicted drawdown at this location is 0.14 feet, which does not represent an impairment in a well that has over 70 feet of available drawdown. These small values of predicted drawdown approach the accuracy limit of the Theis approach as applied to the available dataset.

Water Balance Analysis

To assess impacts to Crescent Lake and Creek and other surface waters in the area, we completed a water balance evaluation of the property and proposed development on an annualized basis. This analysis concentrated on the changes as a result of the proposed project from the pre-development conditions.

We used information presented in Garling and Molenaar (1965) and Welch (2014) to determine the rainfall and infiltration rate of the site. Based on those publications, the site and surrounding area receive 48 inches of rainfall, with 14.5 inches of that resulting in recharge to the aquifers beneath the site

As we understand the project, there will be a home and driveway constructed on the eastern margin of the site, forming impermeable surfaces and potentially increasing runoff. In Pierce County, site development is held to the standards presented in Title 17A of the Pierce County Code and the Pierce County Stormwater Management and Site Development Manual, these require infiltration or dispersion of stormwater falling on impervious surfaces, with the intent to reduce runoff and erosion and enhance recharge to the subsurface. Additionally, per the County Code and Manual, any disturbed soil must be amended to enhance infiltration, which will also serve to reduce runoff from the site. Studies indicate a significant increase in the infiltration rate of tilled, compost-amended soils (Brown and Cotton, 2011; Kays, et al, 2015).

As we understand the project, site development activities will be confined to the area immediately surrounding the proposed home, septic drainfield, driveway, and yard. As planned, there will be several fir and alder trees removed, but incidental clearing will be limited to the eastern portion of the property. For the purposes of this assessment, we have calculated that no clearing or grading will take place further west than the edge of the mapped wetland buffer, yielding

a project area of approximately 30,000 square feet. We have presumed that the soils disturbed during the clearing, grading, and development of the site will be amended, tilled, and graded in accordance with County Code and Manual requirements. We have also presumed that all water falling on impervious surfaces added during development will be infiltrated on site. The change from mature trees to a grass lawn in this area of the property will result in a reduced amount of canopy capture and evapotranspiration, the magnitude of this reduction is approximately 20% (Zhang, et al, 2004; Sanford and Selnick, 2013).

Additionally, where impervious surfaces, such as the house and driveway, occur no vegetation will grow and the evapotranspiration will be nearly zero. To be conservative, we estimate the evapotranspiration will decline in these areas by 90%.

The pre-development water balance of the property can be calculated using the following factors: precipitation, runoff, evapotranspiration, and recharge. The relationship between these factors can be described as follows:

$$N_P - N_R - N_{ET} = \text{Recharge}$$

Where:

$N_P = \text{Precipitation}$

$N_R = \text{Runoff}$

$N_{ET} = \text{Evapotranspiration}$

In the pre-development condition, the site receives 48 inches of precipitation (Garling and Molenaar, 1965). Evapotranspiration in Pierce County is generally estimated at 22 inches per year (Savoca, 2010). Based on the surface geology, recharge is estimated at 15 inches per year (Welch, 2014; Savoca, 2010), so the remaining 11 inches must be considered runoff.

The post-development condition is somewhat more complicated, as the consumptive use calculated earlier must be accounted for and the changes in the nature of the site must be evaluated. Precipitation remains unchanged. Approximately 86% of the area of the site will also remain untouched. The remaining 14% of the site will be cleared, graded, and changed as discussed earlier. A home and driveway will be added, though compliance with County storm-water requirements means that the water falling directly on these impermeable surfaces will be re-routed and infiltrated into the subsurface. These impervious surfaces will cover about 2% of the site.

The nature of the groundcover will change from mature trees to a grass lawn in the area where the yard, drainfield, and reserve drainfield will be located. This will result in a commensurate decrease in evapotranspirative demand discussed earlier. However, in order to keep our analysis conservative, we elected to use three quarters of the earlier-stated decrease (15%). As stated earlier, for the impervious areas, the evapotranspiration rate will be reduced by approximately 90%. The amended soils in this area will have an enhanced infiltration capacity and will more readily accept rainfall, and County regulations require infiltration and dispersion of runoff, significantly reducing runoff from this portion of the property. As a conservative value, we reduced runoff by a half, to a value of 5.5 inches per year.

Septic return flow will offset some of the water use on the property. Typically, 90% of the indoor use is considered to be returned to the drainfield (Culhand and Nazy, 2015). However, we

applied an evapotranspirative loss factor (ranging from 10% in May up to 30% in July and August) to the septic effluent return flow, as laterals may be within reach of plant and turf roots, resulting in the uptake of some of the effluent during hotter months. Finally, the water used outdoors is considered to be a largely consumptive use, with only 20% infiltrated into the subsurface (Culhane and Nazy, 2015).

With these factors, we are able to calculate a post-development water budget via the following relationship:

$$N_P - N_R - N_{ET} - N_{WW} + N_{OR} + N_{SR} = Recharge$$

Where:

N_P = Precipitation

N_R = Runoff

N_{ET} = Evapotranspiration

N_{WW} = Well Withdrawal

N_{OR} = Outdoor Use Return Flow

N_{SR} = Septic Return Flow

The results of this calculation are presented in Table 3.

Table 3: Pre- and post-development annual water balance

Pre-development			Post-development		
	in/yr	gal/day		in/yr	gal/day
Precipitation	48	2459	Precipitation	48	2459
Runoff	-11	-564	Runoff (-50%)	-5.5	-282
Evapotranspiration	-22	-1127	Evapotranspiration (-74.2%) ¹	-16.3	-836
Well Withdrawal	0	0	Well Withdrawal	-4.7	-243
Septic Return	0	0	Outdoor Return (20%)	0.3	14
Outdoor Return	0	0	Septic Return (63% to 90%) ²	2.8	142
Recharge	15	768	Recharge	24.5	1254
			Total Change		485

¹ Reduction prorated for combination of pervious and impervious surfaces

² 90% return flow in wet season ranging downward to 63% in dry season due to ET uptake above drain field

In the post-development condition, groundwater use from the planned well is partially offset by the infiltration of septic return flow and the partial infiltration of water used outside the home. The decrease in evapotranspiration of the developed area of the property, when coupled with the decreased runoff and increased infiltration capacity of the amended soils, will result in an increase to the amount of water recharging the subsurface. The resulting water balance of this project entirely offsets the consumptive use from the proposed well on the property and provides an increase in recharge as a result of the post-development condition.

Seasonal Consideration

The annual water balance indicates an increase in average recharge at the property of 485 gallons per day due to the development. However, this increase in recharge will not occur evenly over the year. The increase in recharge due to the reduction in runoff will occur mainly in the wet season. The reduction in evapotranspiration will occur mostly in the dry season. Water use, and consequently well production, will be higher in the dry season. Return from outdoor water use will occur mainly in the dry season. And return from indoor use will occur year-round, but will be higher in the wet season due to possible uptake by plants above the drain field.

If we consider the dry season to occur from May and October, assign the changes in water balance between wet and dry seasons accordingly, and presume that all the changes in recharge occur during this season, we can develop an approximate change in recharge for the dry season as shown on Table 4.

Table 4: Dry season change in recharge

	gal/day
Precipitation	0
Runoff reduction	0
Evapotranspiration reduction	291
Well Withdrawal ¹	-310
Outdoor Return	14
Septic Return ²	126
Total Change	121

¹ Average well production from May through October

² Average septic return flow from May through October

The effects of both the well production and the recharge will be attenuated relative to aquifer discharges to surface water due to both vertical and horizontal distance and the fact that the aquifers have substantial storage. Timing of recharge entering the aquifer will be attenuated by the approximately 50 feet of sediments between the surface and the upper aquifer. However, as indicated by Table 4, the increase in recharge even during the dry season should be larger than the consumptive use.

In the case of the well, if it is placed in the Qva aquifer, it will be roughly 4,000 to 5,000 feet from the nearest downgradient aquifer discharge point in the Crescent Valley Creek. If it is placed in the lower portion of the QA1 aquifer, it will be 6,000 to 7,000 feet from the likely aquifer discharge points at Colvos Passage. Considering that the highest daily average production rate will be approximately 0.3 gpm, resulting in drawdown in the aquifer outside the wellbore of less than one foot, the change in gradient driving the change in aquifer discharge will be extremely small. Further, this change in gradient should be offset by the increase in recharge. In the case of a well in the Qva aquifer, the production and increase in recharge occur in the same aquifer, negating effects to the nearby creek and lake, which receives discharge from that aquifer. In the case of the well being completed in the QA1 aquifer, the increase in recharge to the shallow aquifer will increase flows to Crescent Creek, while the pumping impact from the well will mostly occur as a smaller discharge directly to Puget Sound. Pumping from the QA1 aquifer may slightly increase leakage downward out the Qva, causing an extremely small decrease in discharge to Crescent Lake and Creek from the Qva, but this will be greatly offset by the increase in recharge to the Qva.

Because of attenuation effects, the system should act largely in a steady-state manner. And certainly, any transient analysis on a time period shorter than wet and dry seasons is not warranted.

Recommendations

Consider drilling the proposed well to at least 100 feet deep in order to complete the well in the deeper portion of the Qva aquifer. The shallower wells have a higher susceptibility to impacts due to surficial contamination and are more likely to experience seasonal deficiencies. Additionally, the wells completed in the deeper portion of the Qva and the Qa1 aquifer have twice the available drawdown, so they should prove to be a more reliable water source over the long term.

Conclusion

Based on our analysis of the information provided, the well proposed to supply this project will not impact or impair a senior water rights holder, and will not impact or impair established in-stream flows and closures as identified by the State. As the net annual water balance in the post-development condition is positive and results in additional infiltration, no mitigation is required.

The statements, conclusions, and recommendations provided in this report are to be exclusively used within the context of this document. They are based upon generally accepted environmental and hydrogeologic practices and are the result of analysis by Robinson Noble, Inc. staff. This report, and any attachments to it, is for the exclusive use of Pat and Juli Sullivan. Unless specifically stated in the document, no warranty, expressed or implied, is made.

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Attachments

- Appendix A Figure 1 – Well Location and Vicinity Map
- Appendix B Well Logs
- Appendix C Soil Logs

APPENDIX A – FIGURES



Legend

- Property Boundary
- ⊕ Well Location
- 1,500 Foot Radius



Note: Image from ESRI ArcGIS

PM: MFP
February 2017
3175-001A

Pierce County
T 22 N/R 02 E - 17
Scale 1" = 800'

Figure 1
Well Location and Vicinity Map
Pat & Juli Sullivan: Hydrogeologic Assessment

APPENDIX B

WATER WELL REPORT

STATE OF WASHINGTON

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

(1) OWNER: Name Harvey Brown Address 15712 Crescent Valley Dr. NW Gig Harb
 (2) LOCATION OF WELL: County Pierce - NE 1/4 NE 1/4 Sec 17 T. 22 N. R. 2E W.M.
 Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic Industrial Municipal
 Irrigation Test Well Other

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
 New well Method: Dug Bored
 Deepened Cable Driven
 Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
 Drilled 86' ft. Depth of completed well 86' ft.

(6) CONSTRUCTION DETAILS:
 Casing installed: 6" Diam. from 0 ft. to 82 ft.
 Threaded " Diam. from _____ ft. to _____ ft.
 Welded " Diam. from _____ ft. to _____ ft.

Perforations: Yes No
 Type of perforator used _____
 SIZE of perforations _____ in. by _____ in.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.

Screens: Yes No Johnson
 Manufacturer's Name _____
 Type stainless steel Model No. _____
 Diam. 6 Slot size 60 from 82 ft. to 86 ft.
 Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel: _____
 Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? 18 ft.
 Material used in seal Bentonite 100 lbs.
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

(7) PUMP: Manufacturer's Name Berkeley
 Type: Submersible HP _____

(8) WATER LEVELS: Land-surface elevation _____ ft.
 Static level 46 ft. below top of well Date _____
 Artesian pressure _____ lbs. per square inch Date _____
 Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? _____
 Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
 _____ " " " " " " " "
 _____ " " " " " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
 Bailer test 10 gal./min. with 20 ft. drawdown after 2 hrs.
 Artesian flow _____ g.p.m. Date _____
 Temperature of water _____ Was a chemical analysis made? Yes No

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Brown top soil	0	3
Gray Hard pan	3	26
Sandy brown hard pan	26	31
Brown sand, some seepage	31	38
Brown sandy clay	38	43
Gray sandy hard pan	43	60
Gray Hard pan	60	68
Gray hard pan with clay	68	74
Gray sand and gravel, -		
water bearing	74	77
Hard packed sand & gravel	77	82
Gray sand & gravel, water	82	86
Gard packed sand & gravel	86	-

RECEIVED

MAY 22 1980

DEPARTMENT OF ECOLOGY
 SOUTHWEST REGIONAL OFFICE

Work started 1-24 19 80 Completed 4-28 19 80

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME HARBOR PUMP & DRILLING CO., INC.
 (Person, firm, or corporation) (Type or print)

Address 11302 Burnham Dr. NW Gig Harbor, WA

[Signed] Wade Johnson By: P. Miller
 (Well Driller)

License No. 223-01-8455 Date April 29, 1980
597

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 065839
Water Right Permit No.

(1) OWNER: Name STACY BRIAN Address 1211 SUNSET DR S TACOMA, WA 98465-
(2) LOCATION OF WELL: County PIERCE - NE 1/4 4M 1/4 Sec 17 T 22 N., R 2E WM
(2a) STREET ADDRESS OF WELL (or nearest address) 3103 156TH ST NW

(3) PROPOSED USE: DOMESTIC
(4) TYPE OF WORK: Owner's Number of well (If more than one) Method: AIR ROTARY
NEW WELL

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 53 ft. Depth of completed well 47 ft.

(6) CONSTRUCTION DETAILS: Casing installed: 6 Dia. from 0 ft. to 47 ft. WELDED Dia. from ft. to ft. Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

Gravel packed: NO
Gravel placed from ft. to ft. Size of gravel ft.

Surface seal: YES To what depth? 48 ft.
Material used in seal BENTONITE CLAY
Did any strata contain movable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off

(7) PUMP: Manufacturer's Name Type H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 20 ft. below top of well Date 12/03/90
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? NO If yes, by whom? hrs.
Yield: gal./min with ft. drawdown after hrs.

Recovery data
Time Water Level Time Water Level Time Water Level
Date of test / /
Bailer test 30 gal./min. 25 ft. drawdown after 1 hrs.
Air test gal./min. w/ stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

MATERIAL	FROM	TO
SANDY TOPSOIL	0	2
SAND AND SOME GRAVEL	2	9
COMPACTED SAND	9	14
COMPACTED SAND AND CLAY	14	24
SEEPAGE SAND CLAY	24	26
HARDPAN	26	42
WATER SAND & GRAVEL	42	47
DIRTY SAND	47	53

Work started 11/30/90 Completed 12/03/90

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME RICHARDSON WELL DRILLING
(Person, firm, or corporation) (Type or print)
ADDRESS PO BOX 44427 TAC WA 98444
[SIGNED] *Richardson* License No. 0284
Contractor's Registration No. RICHAN*32108 Date 01/22/91

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)

Construction
 Decommission ORIGINAL CONSTRUCTION Notice
 127549 of Intent Number _____

PROPOSED USE: Domestic Industrial Municipal
 DeWater Irrigation Test Well Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
 New Well Reconditioned Method Dug Bored Driven
 Deepened Cable Rotary Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 102 ft
 Depth of completed well 103 ft

CONSTRUCTION DETAILS
 Casing Welded 6 " Diam from 0 ft. to 103 ft
 Installed: Liner installed _____ " Diam from _____ ft. to _____ ft
 Threaded _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes No
 Type of perforator used _____
 SIZE of perfs _____ in by _____ in and no of perfs _____ from _____ ft to _____ ft

Screens: Yes No K-Pac Location 93
 Manufacturer's Name Johnson
 Type Stainless Steel Model No _____
 Diam 5" Slot Size 10 from 102 ft to 96 ft
 Diam _____ Slot Size _____ from _____ ft to _____ ft

Gravel/Filter packed: Yes No Size of gravel/sand _____
 Materials placed from _____ ft to _____ ft.

Surface Seal: Yes No To what depth? 19 ft
 Materials used in seal Bentonite
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

PUMP: Manufacturer's Name _____
 Type _____ HP _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
 Static level 65 ft below top of well Date _____
 Artesian pressure _____ lbs per square inch Date _____
 Artesian water is controlled by _____ (cap, valve, etc)

WELL TESTS: Drawdown is amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? _____
 Yield 10 gal./min with 25' ft drawdown after 2 hrs
 Yield _____ gal./min with _____ ft drawdown after _____ hrs
 Yield _____ gal./min with _____ ft drawdown after _____ hrs
 Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
<u>12:00</u>	<u>74'</u>				
<u>12:05</u>	<u>67'</u>				

 Date of test _____
 Bailer test 12 gal./min with _____ ft drawdown after 2 hrs
 Airtest _____ gal./min with stem set at _____ ft for _____ hrs
 Artesian flow _____ g p m Date _____
 Temperature of water _____ Was a chemical analysis made? Yes No

CURRENT
 Notice of Intent No. W061595
 Unique Ecology Well ID Tag No. A3A-064
 Water Right Permit No. _____

Property Owner Name JOE LAW
 Well Street Address 18826 28th AVE NW
 City GRAND HARBOR County: PIERCE
 Location NE 1/4 - 1/4 NW 1/4 Sec. 17 Twn 22 R 2 EWM or one WWM
 Lat/Long: Lat Deg _____ Lat Min/Sec _____
 (s, t, r still REQUIRED) Long Deg _____ Long Min/Sec _____
 Tax Parcel No. 0222171054

CONSTRUCTION OR DECOMMISSION PROCEDURE
 Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top soil	0	4
clay-gravel	4	11
clay-gravel-boulders	11	16
brown sand	16	47
gravel-sand-clay	47	83
gray clay-sand	83	85
gravel-sand-clay	85	96
sand gray W.B.	96	102

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JAN 16 2003

Washington State
 Department of Ecology

Start Date 12/4/02 Completed Date 12/23/02

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (Print) Bruce Lewis
 Driller/Engineer/Trainee Signature Bruce Lewis
 Driller or Trainee License No. 2627

Drilling Company HARBOR TUNEP CO. INC
 Address P.O. Box 330
 City, State, Zip BEARLEY WA. 98322
 Contractor's Registration No. HARBOR001404 Date 1/13/03

If trainee, licensed driller's Signature and License no. _____

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)
 Construction
 Decommission ORIGINAL CONSTRUCTION Notice
 130700 of Intent Number

PROPOSED USE: Domestic Industrial Municipal
 DeWater Irrigation Test Well Other

TYPE OF WORK: Owner's number of well (if more than one) _____
 New Well Reconditioned Method: Dug Bored Driven
 Deepened Cable Rotary Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 218 ft
 Depth of completed well 218 ft

CONSTRUCTION DETAILS
 Casing Welded 6 " Diam from 71 ft to 213 ft
 Installed: Liner installed _____ " Diam from _____ ft to _____ ft
 Threaded _____ " Diam from _____ ft to _____ ft.

Perforations: Yes No
 Type of perforator used _____
 SIZE of perfs _____ in by _____ in. and no of perfs _____ from _____ ft to _____ ft

Screens: Yes No K-Pac Location _____
 Manufacturer's Name _____
 Type 3/S Model No _____
 Diam 6T Slot Size 010 from 213 ft to 218 ft
 Diam _____ Slot Size _____ from _____ ft to _____ ft

Gravel/Filter packed: Yes No Size of gravel/sand _____
 Materials placed from _____ ft to _____ ft.

Surface Seal: Yes No To what depth? 18 ft
 Materials used in seal Holeplug
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

PUMP: Manufacturer's Name Gould
 Type Submersible HP 3/4

WATER LEVELS: Land-surface elevation above mean sea level _____ ft
 Static level 92.5 ft below top of well Date 3/5/03
 Artesian pressure _____ lbs per square inch Date _____
 Artesian water is controlled by _____ (cap, valve, etc)

WELL TESTS: Drawdown is amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? by Driller
 Yield 16 gal/min with 45 ft drawdown after 1 hrs
 Yield _____ gal/min with _____ ft drawdown after _____ hrs
 Yield _____ gal/min with _____ ft drawdown after _____ hrs

Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
<u>8:00</u>	<u>137</u>	<u>2:10</u>	<u>92.5</u>		
<u>5:00</u>	<u>110</u>				
<u>10:12</u>	<u>96</u>				

Date of test _____
 Bailer test _____ gal/min with _____ ft drawdown after _____ hrs
 Airtest _____ gal/min with stem set at _____ ft for _____ hrs
 Artesian flow _____ g p m Date _____
 Temperature of water _____ Was a chemical analysis made? Yes No

CURRENT Notice of Intent No. W162612
 Unique Ecology Well ID Tag No. AGE 533
 Water Right Permit No. _____

Property Owner Name ANN Lemieux
 Well Street Address 15625 Crescent VY Dr NW
 City Big Harbor County: Pierce
 Location NE 1/4-1/4 NE 1/4 Sec. 17 Twn 22 R. 2 ^{EWN} circle or one WWM
 Lat/Long: Lat Deg _____ Lat Min/Sec _____
 (s, r still REQUIRED) Long Deg _____ Long Min/Sec _____
 Tax Parcel No. 0222171065

CONSTRUCTION OR DECOMMISSION PROCEDURE
 Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
Top soil	0	1
Sand & gravel	1	5
gravelly Hardpan	5	60
Hardpan	60	88
Sand	88	91
Clayish Hardpan + gravel	91	194
Fine sand	194	210
Sand	210	218

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APR 04 2003

DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

FISCAL & BUDGET

03 APR - 11 11:04

Start Date 2/17/03 Completed Date 3/4/03

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (Print) Wesley Glessner Drilling Company Wes Glessner Drilling
 Driller/Engineer/Trainee Signature Wesley Glessner Address PO Box 487
 Driller or Trainee License No. 0154 City, State, Zip Burley WA 98322
 Contractor's Registration No. WESG1020826 Date 3/5/03
 Ecology is an Equal Opportunity Employer ECY 050-1-20 (Rev 4/01)

If trainee, licensed driller's Signature and License no. _____

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

22-22-20f



WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)

Construction
 Decommission ORIGINAL INSTALLATION Notice

205208 of Intent Number _____

CURRENT
Notice of Intent No. W216866

Unique Ecology Well ID Tag No. APR640

Water Right Permit No. _____

Property Owner Name Swen Weinmann

Well Street Address 15515 30th AVE NW

City Gig Harbor County Pierce

Location SE 1/4-1/4 NW 1/4 Sec 20 Twp 22NR 2E EWM or WWM circle one

Lat/Long (s, t, r) Lat Deg _____ Lat Min/Sec _____

Still **REQUIRED** Long Deg _____ Long Min/Sec _____

Tax Parcel No. 0222171051

PROPOSED USE: Domestic Industrial Municipal
 DeWater Irrigation Test Well Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
 New well Reconditioned Method: Dug Bored Driven
 Deepened Cable Rotary Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 160 ft.
Depth of completed well 160 ft.

CONSTRUCTION DETAILS
Casing Welded 6 " Diam. from +1 ft. to 155 ft.
Installed: Liner installed _____ " Diam. from _____ ft. to _____ ft.
 Threaded _____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes No
Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: Yes No K-Pac Location 154
Manufacturer's Name Johnson

Type Stainless steel Model No. _____
Diam. 5 Slot size _____ ft. to _____ ft.
Diam. 14 Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: Yes No Size of gravel/sand _____ ft.
Materials placed from _____ ft. to _____ ft.

Surface Seal: Yes No To what depth? 18 ft.
Material used in seal Bentonite

Did any strata contain unusable water? Yes No
Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name Goulds
Type: Submersible H.P. 1

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 108 ft. below top of well Date 10/25/07

Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes, by whom? Olsen Dr1.

Yield: 15 gal./min. with 9 ft. drawdown after 1 hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
0	117'	3 m	108'		
1 m	111'				
2 m	104'				

Date of test 10/25/07

Bailer test 10 gal./min. with 8 ft. drawdown after 2 hrs.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Brown sand	0	37
Grey till	37	132
Grey clay	132	136
Grey sand	136	145
Grey sand w/b	145	160
Grey tight sand	160	----

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NOV 14 2007
DEPT. OF ECOLOGY

Start Date 9/20/07 Completed Date 10/25/07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (Print) Matt Olsen
Driller/Engineer/Trainee Signature [Signature]
Driller or trainee License No. 2337

Drilling Company Olsen Drilling
Address PO Box 1554
City, State, Zip Port Orchard, WA 98366

If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Contractor's
Registration No. OLSEND101LJ Date 11/9/07

Ecology is an Equal Opportunity Employer.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Well Log Data and Image are 'As Is' with NO Warranty. Well Log ID:

339850

Start Card No. W 34136
UNIQUE WELL I.D. # A66 626

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Water Right Permit No.

(1) OWNER: Name Hallstrom, Mark Address 4911 No. Highland, Tacoma WA

(2) LOCATION OF WELL: County Pierce NW/4 NW 1/4 Sec 17 T.28N N. R. 25 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) 3025 156th St., N.W., Big Harbor, WA

(3) PROPOSED USE: Domestic Irrigation Industrial Municipal
 DeWater Test Well Other

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned New well Method: Dug Bored
Deepened Cable Driven
Reconditioned Rotary Jetted

MATERIAL	FROM	TO
Top Soil	0	2
Brown Sands some traces of Brown Silts	2	11
Brown Silts & Medium Sands & sand irregular Gravel	11	31
Silty Gray Sands sticky	31	36
Gravel & Sands water bearing	36	53

(5) DIMENSIONS: Diameter of well 6" inches.
Drilled 53 feet. Depth of completed well 53 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +2 ft. to 53 ft.
Welded Liner installed Threaded

Perforations: Yes No
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes No
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? 19.5 ft.
Material used in seal Benfonite
Did any strata contain unusable water? Yes No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P.

(8) WATER LEVELS: Land surface elevation above mean sea level _____
Static level 22 ft. below top of well Date Nov 3, 1994
Artesian pressure _____ lbs per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Time	Water Level	Time	Water Level	Time	Water Level

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Artest 9-10 gal./min. with stem set at 53 ft. for 2.0 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes No

94 DEC 12 AM 9:47
RECEIVED
S.W. ENGINEERING & CONSTRUCTION
10671 Todd Rd., Puyallup WA 98443
Work Started Nov 2 19 _____ Completed Nov 3 19 94

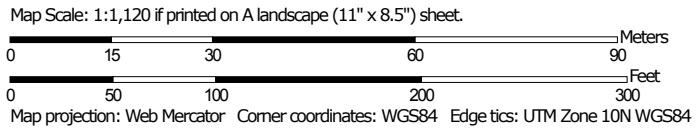
WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.
NAME Hall Testing Inc. (PERSON, FIRM OR CORPORATION) (TYPE OR PRINT)
Address 10671 Todd Rd., Puyallup
(Signed) Mark Hallstrom License No. 2198
Contractor's Registration No. AD11710870J Date Nov 3 19 94
(USE ADDITIONAL SHEETS IF NECESSARY)

APPENDIX C

Soil Map—Pierce County Area, Washington
(Sullivan_3175-001A_Parcel)




Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 11, Sep 9, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 1, 2011—Aug 20, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Pierce County Area, Washington (WA653)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
16C	Harstine gravelly ashy sandy loam, 6 to 15 percent slopes	4.5	88.4%
16D	Harstine gravelly ashy sandy loam, 15 to 30 percent slopes	0.6	11.6%
Totals for Area of Interest		5.1	100.0%

Pierce County Area, Washington

16C—Harstine gravelly ashy sandy loam, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2rtvj
Elevation: 200 to 390 feet
Mean annual precipitation: 30 to 55 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 200 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Harstine and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Harstine

Setting

Landform: Ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Nose slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy glacial drift with an influence of volcanic ash over dense glaciomarine deposits

Typical profile

Oi - 0 to 0 inches: slightly decomposed plant material
Oe - 0 to 1 inches: moderately decomposed plant material
Bw1 - 1 to 6 inches: gravelly ashy sandy loam
Bw2 - 6 to 14 inches: gravelly ashy sandy loam
Bw3 - 14 to 22 inches: gravelly ashy sandy loam
Bw4 - 22 to 32 inches: gravelly ashy sandy loam
2Cd1 - 32 to 38 inches: gravelly loamy sand
2Cd2 - 38 to 61 inches: gravelly loamy sand

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: About 24 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: C

Other vegetative classification: Limited Depth Soils
(G002XN302WA)

Hydric soil rating: No

Minor Components

Indianola

Percent of map unit: 5 percent

Landform: Eskers, kames, terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Norma

Percent of map unit: 3 percent

Landform: Depressions, drainageways

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Dupont

Percent of map unit: 3 percent

Landform: Depressions, troughs

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Neilton

Percent of map unit: 2 percent

Landform: Outwash terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Mckenna

Percent of map unit: 2 percent

Landform: Depressions, drainageways

Landform position (three-dimensional): Dip

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 11, Sep 9, 2016

Pierce County Area, Washington

16D—Harstine gravelly ashy sandy loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2rtvk

Elevation: 200 to 390 feet

Mean annual precipitation: 30 to 55 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 180 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Harstine and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Harstine

Setting

Landform: Ridges

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Sandy glacial drift with an influence of volcanic ash over dense glaciomarine deposits

Typical profile

Oi - 0 to 0 inches: slightly decomposed plant material

Oe - 0 to 1 inches: moderately decomposed plant material

Bw1 - 1 to 6 inches: gravelly ashy sandy loam

Bw2 - 6 to 14 inches: gravelly ashy sandy loam

Bw3 - 14 to 22 inches: gravelly ashy sandy loam

Bw4 - 22 to 32 inches: gravelly ashy sandy loam

2Cd1 - 32 to 38 inches: gravelly loamy sand

2Cd2 - 38 to 61 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 20 to 39 inches to densic material

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Depth to water table: About 24 to 37 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Other vegetative classification: Limited Depth Soils
(G002XN302WA)

Hydric soil rating: No

Minor Components

Indianola

Percent of map unit: 5 percent

Landform: Eskers, kames, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Neilton

Percent of map unit: 5 percent

Landform: Outwash terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Data Source Information

Soil Survey Area: Pierce County Area, Washington

Survey Area Data: Version 11, Sep 9, 2016

APPENDIX C

WATER WELL REPORT

STATE OF WASHINGTON

Application No. _____
 Permit No.

(1) OWNER: Name A. L. Hart (Tallman) Address 15616 Crescent Valley Dr. N.W. Gig Harbor, Wn.

(2) LOCATION OF WELL: County Pierce NE 1/4 NE 1/4 Sec 17 T 22 N. R. 2E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic Industrial Municipal
 Irrigation Test Well Other

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
 New well Method: Dug Bored
 Deepened Cable Driven
 Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
 Drilled 90 ft. Depth of completed well 90 ft.

(6) CONSTRUCTION DETAILS:
 Casing installed: 6" Diam. from 0 ft. to 85 1/2 ft.
 Threaded " Diam. from _____ ft. to _____ ft.
 Welded " Diam. from _____ ft. to _____ ft.

Perforations: Yes No
 Type of perforator used _____
 SIZE of perforations _____ in. by _____ in.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.

Screens: Yes No
 Manufacturer's Name Johnson
 Type stainless steel Model No. _____
 Diam. 6 Slot size 35 from 85 ft. to 90 ft.
 Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel: _____
 Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? _____ ft.
 Material used in seal _____
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
 Type: _____ HP _____

(8) WATER LEVELS: Land-surface elevation ~340 ft. above mean sea level.
 Static level 45 ft. below top of well Date 10-16-62
 Artesian pressure _____ lbs. per square inch Date _____
 Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? _____
 Yield: gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 10-16-62
 Baller test 40 gal./min. with 25 ft. drawdown after _____ hrs.
 Artesian flow _____ g.p.m. Date _____
 Temperature of water _____ Was a chemical analysis made? Yes No

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Topsoil	0	2
Sand & gravel brown hardpan	2	37
Blue sand & gravel hardpan	37	53
Sand & gravel some water	53	63
Gray hardpan some seepage	63	84
Sand & gravel water bearing	84	90

RECEIVED

JUN 12 1975

DEPARTMENT OF ECOLOGY
 SOUTHWEST REGIONAL OFFICE

22/RE-17A

Work started 10-13-62 Completed 10-16-62

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Harbor Pump & Drilling Co., Inc.
 (Person, firm, or corporation) (Type or print)

Address 7825 46th Ave. N.W. Gig Harbor, Wn. 9833

(Signed) Sybil Huston By: M. Butler
 (Well Driller)

License No. 0476 223-01-8455 Date 6-11-74

(USE ADDITIONAL SHEETS IF NECESSARY)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

STATE OF WASHINGTON

Application No
Permit No.

(1) OWNER: Name Harvey Brown Address 15712 Crescent Valley Dr. NW Gig Hrb
(2) LOCATION OF WELL: County Pierce ME NE 17 22 23 W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic Industrial Municipal
Irrigation Test Well Other

(4) TYPE OF WORK: Owner's number of well (if more than one) 86
New well Method: Dug Bored
Deepened Cable Driven
Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 86 ft. Depth of completed well 86 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 0 ft. to 82 ft.
Threaded " Diam. from " ft. to " ft.
Welded " Diam. from " ft. to " ft.

Perforations: Yes No
Type of perforator used
SIZE of perforations in. by in.
perforations from " ft. to " ft.
perforations from " ft. to " ft.
perforations from " ft. to " ft.

Screens: Yes No Johnson
Manufacturer's Name
Type stainless steel Model No. 86
Diam. 6 Slot size 60 from 82 ft. to 86 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes No Size of gravel: ft.
Gravel placed from ft. to ft.

Surface seal: Yes No To what depth? 18 ft.
Material used in seal Bentonite 100 lbs.
Did any strata contain unusable water? Yes No
Type of water? Depth of strata
Method of sealing strata off.

(7) PUMP: Manufacturer's Name Berkeley
Type: Submersible HP

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 46 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap. valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Baller test 10 gal./min. with 20 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes No

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Brown top soil	0	3
Gray Hard pan	3	26
Sandy brown hard pan	26	31
Brown sand, some seepage	31	38
Brown sandy clay	38	43
Gray sandy hard pan	43	60
Gray Hard pan	60	68
Gray hard pan with clay	68	74
Gray sand and gravel, - water bearing	74	77
Hard packed sand & gravel	77	82
Gray sand & gravel, water	82	86
Hard packed sand & gravel	86	-

RECEIVED
MAY 22 1980

DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

Work started 4-24 19 80 Completed 4-28 19 80

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME HARBOP PUMP & DRILLING CO., INC.
(Person, firm, or corporation) (Type or print)

Address 11302 Burnham Dr. NW Gig Harbor, WA

[Signed] Wade Johnson By: F. Miller
(Well Driller)

License No. 223-01-8455 Date April 29 19 80
597

File Original and First Copy with
Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Water Right Permit No. _____

(1) OWNER: Name John Perry 154 Th. Street, Wallingford, WA 98148

(2) LOCATION OF WELL: County Pierce SW NE 1/4 Sec 17 T22 N. R. 2E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) 154 Th. Street, Wallingford, WA 98148

(3) PROPOSED USE: Domestic Industrial Municipal
 Irrigation Test Well Other
 DeWater

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned New well Method: Dug Bored
Despensed Cable Driven
Reconditioned Rotary Jetted

MATERIAL	FROM	TO
Top Soil	0	2
Sand Brown	2	13
Hard Pan	13	33
Sand + Gravel (sandy)	33	35
Clay (Blue)	35	122
Hard Pan	122	128
Sand + Gravel (H.C.)	128	151

(5) DIMENSIONS: Diameter of well Six inches.
Drilled 151 feet. Depth of completed well 151 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 1 ft. to 146 ft.
Welded " Diam. from _____ ft. to _____ ft.
Liner installed " Diam. from _____ ft. to _____ ft.
Threaded " Diam. from _____ ft. to _____ ft.

Perforations: Yes No
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes No
Manufacturer's Name COOK
Type STAINLESS Model No. _____
Diam. 6 Slot size 12 from 146 ft. to 151 ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? 18 ft.
Material used in seal Concrete
Did any strata contain unusable water? Yes No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name Gould's
Type: Submersible H.P. 3/4

(8) WATER LEVELS: Land-surface elevation _____ ft. above mean sea level
Static level 90 ft. below top of well Date 2-21-91
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes, by whom? P.P.P.
Yield: 14 gal./min. with 7 ft. drawdown after 2 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
<u>0</u>	<u>77</u>				
<u>2</u>	<u>70</u>				

Date of test _____
Boiler test 20 gal./min. with 10 ft. drawdown after 1 hrs.
Artest _____ gal./min. with stem seal at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes No

Work started Aug-30, 1970 completed Sept 6, 1970

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME P.P.P. Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address Port Orchard

(Signed) P.T. Wally License No. 0521
(WELL DRILLER)

Contractor's Registration No. P.P.P. W.D. Date Sept 10, 1970

(USE ADDITIONAL SHEETS IF NECESSARY)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 063839
Water Right Permit No.

(1) OWNER: Name **STACY BRIAN** Address **1211 SUNSET BR S TACOMA, WA 98465-**

(2) LOCATION OF WELL: County **PIERCE** - NE 1/4 4th 1/4 Sec 17 T 22 N., R 2E W1
(2a) STREET ADDRESS OF WELL (or nearest address) **3103 25th ST NW**

(3) PROPOSED USE: **DOMESTIC**

(10) WELL LOG

(4) TYPE OF WORK: **NEW WELL**
Owner's Number of well (if more than one)
Method: **AIR ROTARY**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 33 ft. Depth of completed well 47 ft.

MATERIAL	FROM	TO
SANDY TOPSOIL	0	2
SAND AND SOME GRAVEL	2	9
COMPACTED SAND	9	14
COMPACTED SAND AND CLAY	14	24
SEEPAGE SAND CLAY	24	26
HARDPAN	26	42
WATER SAND & GRAVEL	42	47
DIRTY SAND	47	53

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Dia. from 0 ft. to 47 ft.
WELDED Dia. from ft. to ft.
Dia. from ft. to ft.

Perforations: **NO**
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: **NO**
Manufacturer's Name
Type
Dia. slot size from ft. to ft.
Dia. slot size from ft. to ft.

Gravel packed: **NO**
Gravel placed from ft. to ft. Size of gravel ft.

Surface seal: **YES** To what depth? 18 ft.
Material used in seal **BENTONITE CLAY**
Did any strata contain geusable water? **NO**
Type of water? Depth of strata ft.
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type

(8) WATER LEVELS: Land-surface elevation
Static level 20 ft. above sea level Date 12/02/90
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

Work started 11/30/90 Completed 12/02/90

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Has a pump test made? **NO** If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Recovery data
Time Water Level Time Water Level Time Water Level

NAME **RICHARDSON WELL DRILLING**
(Person, firm, or corporation) (Type or print)

Date of test 1/1
Bailer test 30 gal./min. 25 ft. drawdown after 1 hrs.
Air test gal./min. w/ stem set at ft. for hrs.
Artesian flow g.p.s. Date
Temperature of water Was a chemical analysis made? **NO**

ADDRESS **PO BOX 44427 TAC WA 98444**
[SIGNED] *[Signature]* License No. 0284
Contractor's Registration No. **RICHAN#S2108** Date **01/22/91**

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W052689

UNIQUE WELL I.D. # ABP815

Water Right Permit No. _____

(1) OWNER: Name PEDRO AND WENDY PINTO Address 22404 Military Road S., Sea-Tac, WA 98198

(2) LOCATION OF WELL: County Pierce NW 1/4 NE 1/4 Sec 17 T. 22 N. R. 2E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) off Crescent Valley Road

(3) PROPOSED USE: Domestic Industrial Municipal
 Irrigation Test Well Other
 DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
 Abandoned New well Method: Dug Bored
 Deepened Cable Driven
 Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
 Drilled 178 feet. Depth of completed well 178 ft.

(6) CONSTRUCTION DETAILS:
 Casting installed: 6 ft. Diam. from 0 ft. to 178 ft.
 Welded Slotted Diam. from _____ ft. to _____ ft.
 Liner installed Threaded Diam. from _____ ft. to _____ ft.

Perforations: Yes No
 Type of perforator used _____
 SIZE of perforations _____ in. by _____ in.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.
 _____ perforations from _____ ft. to _____ ft.

Screens: Yes No
 Manufacturer's Name _____
 Type _____ Model No. _____
 Diam. _____ Slot size _____ from _____ ft. to _____ ft.
 Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel _____
 Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? 18 ft.
 Material used in seal Bentonite
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

(7) PUMP: Manufacturer's Name Goulds
 Type: submersible 10GS10 H.P. 1

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
 Static level 107 ft. below top of well Date 5/02/95
 Artesian pressure _____ lbs. per square inch Date _____
 Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown in amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? Gresham
 Yield: 15 gal./min. with 18 ft. drawdown after 2 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
Full recov.	in 5 min.				

Date of test 5/02/95
 Bailor test _____ gal./min. with _____ ft. drawdown after _____ hrs.
 Airstest 20+ gal./min. with stem set at 170 ft. for 1 hrs.
 Artesian flow _____ g.p.m. Date _____
 Temperature of water 50 Was a chemical analysis made? Yes No

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Brown topsoil	0	4
Gray hardpan	4	27
Gray silty sand & gravel	27	69
Gray hardpan	69	93
Gray silty sand & gravel	93	131
Gray hardpan	131	164
Gray clay w/gravel	164	167
Gray silty coarse sand & gravel, H2O	167	178

RECEIVED
 MAY 15 10 30 AM '95
 SW RPT DIVISION

Work Started 4/26/95, 19. Completed 4/27/95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Gresham Well Drilling, Inc.
 (PERSON, FIRM OR CORPORATION) (TYPE OR PRINT)
 Address 3105 NW Lakeness Rd., Poulsbo, WA 98370
 (Signed) [Signature] License No. 0761
 (WELL DRILLER)

Contractor's Registration No. GRESHWD055BC Date 5/04/95, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6008.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)

Construction
 Decommission ORIGINAL CONSTRUCTION Notice of Intent Number 127549

PROPOSED USE: Domestic Industrial Municipal
 DeWater Irrigation Test Well Other

TYPE OF WORK: Owner's number of well (if more than one) _____
 New Well Reconditioned Method Dug Bored Driven
 Deepened Cable Rotary Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 102 ft
 Depth of completed well 103 ft

CONSTRUCTION DETAILS
 Casing Welded 6" Diam from 0 ft to 103 ft
 Installed: Liner installed _____" Diam from _____ ft to _____ ft
 Threaded _____" Diam. from _____ ft to _____ ft.

Perforations: Yes No
 Type of perforator used _____
 SIZE of perfs _____ in by _____ in and no of perfs _____ from _____ ft to _____ ft

Screens: Yes No K-Pac Location 98
 Manufacturer's Name Johnson
 Type Stainless Steel Model No _____
 Diam 5" Slot Size 10 from 102 ft to 96 ft
 Diam _____ Slot Size _____ from _____ ft to _____ ft

Gravel/Filter packed: Yes No Size of gravel/sand _____
 Materials placed from _____ ft to _____ ft.

Surface Seal: Yes No To what depth? 19 ft
 Materials used in seal Benlonite
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

PUMP: Manufacturer's Name _____
 Type _____ HP

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
 Static level 65 ft below top of well Date _____
 Artesian pressure _____ lbs per square inch Date _____
 Artesian water is controlled by _____ (cap, valve, etc)

WELL TESTS: Drawdown is amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? _____
 Yield 10 gal/min with 25' ft drawdown after 2 hrs
 Yield _____ gal/min with _____ ft drawdown after _____ hrs
 Yield _____ gal/min with _____ ft drawdown after _____ hrs

Recovery data (time taken as zero when pump turned off)(water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
<u>1:40</u>	<u>67'</u>				
<u>1:45</u>	<u>67'</u>				

Date of test _____
 Bailer test 12 gal/min with _____ ft drawdown after 2 hrs
 Airtest _____ gal/min with stem set at _____ ft for _____ hrs
 Artesian flow _____ g p m Date _____
 Temperature of water _____ Was a chemical analysis made? Yes No

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (Print) Bruce Lewis
 Driller/Engineer/Trainee Signature Bruce Lewis
 Driller or Trainee License No. 2627

If trainee, licensed driller's _____
 Signature and License no. _____

CURRENT Notice of Intent No. W061595
 Unique Ecology Well ID Tag No. ABA-064
 Water Right Permit No. _____

Property Owner Name JOE LAW

Well Street Address 18826 28th AVE NW

City GRAND HARBOR County: PIERCE

Location NE 1/4 - 1/4 NW 1/4 Sec. 17 Twn 22 R 2 EWM circle or one WWM

Lat/Long: Lat Deg _____ Lat Min/Sec _____
 (s, L, R still REQUIRED) Long Deg _____ Long Min/Sec _____

Tax Parcel No. 0222171054

CONSTRUCTION OR DECOMMISSION PROCEDURE
 Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
<u>Top soil</u>	<u>0</u>	<u>4</u>
<u>clay-gravel</u>	<u>4</u>	<u>11</u>
<u>clay-gravel-boulders</u>	<u>11</u>	<u>16</u>
<u>brown sand</u>	<u>16</u>	<u>47</u>
<u>gravel-sand-clay</u>	<u>47</u>	<u>83</u>
<u>gray clay-sand</u>	<u>83</u>	<u>85</u>
<u>gravel-sand-clay</u>	<u>85</u>	<u>96</u>
<u>sand gray w/br</u>	<u>96</u>	<u>102</u>

RECEIVED

JAN 16 2003

Washington State
 Department of Ecology

Start Date 12/4/02 Completed Date 12/23/02

Drilling Company HARBOR Trench Co. LLC
 Address P.O. Box 370

City, State, Zip BEIRLEY WA. 98322
 Contractor's Registration No. HARBORPC11404 Date 1/13/03

Ecology is an Equal Opportunity Employer EGY 050-1-20 (Rev 4/01)

The Department of Ecology does Not Warranty the Data and/or the information on this well Report.

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)

Construction
 Decommission ORIGINAL CONSTRUCTION Notice
 of Intent Number 130700

PROPOSED USE: Domestic Industrial Municipal
 DeWater Irrigation Test Well Other

TYPE OF WORK: Owner's number of well (if more than one)
 New Well Reconditioned Method: Dug Bored Driven
 Deepened Cable Rotary Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 218 ft
 Depth of completed well 218 ft

CONSTRUCTION DETAILS
 Casing Welded 6" Diam from 71 ft to 213 ft
 Installed: Liner installed _____" Diam from _____ ft to _____ ft
 Threaded _____" Diam from _____ ft to _____ ft

Perforations: Yes No
 Type of perforator used _____
 SIZE of perfs 1/8 in by _____ in. and no of perfs _____ from _____ ft to _____ ft

Screens: Yes No K-Pac Location _____
 Manufacturer's Name _____
 Type S/S Model No _____
 Diam 6.7 Slot Size 10/10 from 213 ft to 218 ft
 Diam _____ Slot Size _____ from _____ ft to _____ ft

Gravel/Filter packed: Yes No Size of gravel/sand _____
 Materials placed from _____ ft to _____ ft

Surface Seal: Yes No To what depth? 18 ft
 Materials used in seal Holeplug
 Did any strata contain unusable water? Yes No
 Type of water? _____ Depth of strata _____
 Method of sealing strata off _____

PUMP: Manufacturer's Name Gould
 Type Submersible HP 3/4

WATER LEVELS: Land-surface elevation above mean sea level _____ ft
 Static level 92.5 ft below top of well Date 3/5/03
 Artesian pressure _____ lbs per square inch Date _____
 Artesian water is controlled by _____ (cap, valve, etc)

WELL TESTS: Drawdown is amount water level is lowered below static level
 Was a pump test made? Yes No If yes, by whom? by Driller
 Yield 16 gal/min with 45 ft drawdown after 1 hrs
 Yield _____ gal/min with _____ ft drawdown after _____ hrs
 Yield _____ gal/min with _____ ft drawdown after _____ hrs

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
<u>8:00</u>	<u>137</u>	<u>20:10</u>	<u>92.5</u>		
<u>5:00</u>	<u>110</u>				
<u>10:15</u>	<u>96</u>				

Date of test _____
 Bailor test _____ gal/min with _____ ft drawdown after _____ hrs
 Artesian _____ gal/min with stem set at _____ ft for _____ hrs
 Artesian flow _____ g p m Date _____
 Temperature of water _____ Was a chemical analysis made? Yes No

CURRENT Notice of Intent No. W162612

Unique Ecology Well ID Tag No. AGE 533

Water Right Permit No. _____

Property Owner Name ANN Lemieux

Well Street Address 15625 Crescent Vy Dr NW

City Big Harbor County: Pierce

Location NE 1/4 1/4 NE 1/4 Sec. 17 Twn 22 R 2 circle or one WWM

Lat/Long: Lat Deg _____ Lat Min/Sec _____
 (s, r still REQUIRED) Long Deg _____ Long Min/Sec _____

Tax Parcel No. 0222171065

CONSTRUCTION OR DECOMMISSION PROCEDURE
 Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL	FROM	TO
Top soil	0	1
Sand & gravel	1	5
gravelly Hardpan	5	60
Hardpan	60	88
Sand	88	91
Clayish Hardpan + gravel	91	194
Fine gravel	194	210
Sand	210	218

RECEIVED DEPT. OF ECOLOGY
 APR 04 2003
 DEPARTMENT OF ECOLOGY
 WELL DRILLING UNIT
 03 APR - 1 01:04

Start Date 2/17/03 Completed Date 3/4/03

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name (Print) Wesley Glessner Drilling Company Wes Glessner Drilling
 Driller/Engineer/Trainee Signature Wesley Glessner Address Po Box 487
 Driller or Trainee License No. 0154 City, State, Zip Burley Wa 98322

If trainee, licensed driller's _____
 Signature and License no. _____

Contractor's Registration No. WESGLO020016 Date 3/5/03
 Ecology is an Equal Opportunity Employer ECV 050-1-20 (Rev 4/01)

The Department of Ecology does NOT warrant the Data and/or the Information on this Well Report.

The Well Log Data and Image are 'As Is' with NO Warranty. Well Log ID: [REDACTED]

339850

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 34136

UNIQUE WELL I.D. # ADA 626

Water Right Permit No. _____

(1) OWNER: Name Hallstrom, Clark Address 4811 No. Highland, Tacoma WA

(2) LOCATION OF WELL: County Pierce NW 1/4 NW 14 Sec 17 T. 29N. R. 25 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) 3025 18th St, NW, Big Harbor, WA

(3) PROPOSED USE: Domestic Irrigation Industrial Municipal
 DeWater Test Well Other

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Top Soil	0	2
Thin Sands some traces of clay silt	2	11
Thin silts & medium sands & sand angular gravels	11	31
Silty sand sands silty	31	36
Gravels & sands under bearing	36	53

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned New well Method: Dug Bored
Deepened Cable Driven
Reconditioned Rotary Jetted

(5) DIMENSIONS: Diameter of well 6" inches.
Dripped 53 feet. Depth of completed well 53 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" diam. from +2 ft to 53 ft.
Welded Liner installed Threaded

Perforations: Yes No
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft. to _____ ft.

Screens: Yes No
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot size _____ from _____ ft. to _____ ft.
Diam. _____ Spt size _____ from _____ ft. to _____ ft.

Gravel packed: Yes No Size of gravel _____
Gravel placed from _____ ft. to _____ ft.

Surface seal: Yes No To what depth? 19.5 ft.
Material used in seal Benbowite
Did any strata contain unusable water? Yes No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land surface elevation above mean sea level _____
Static level 22 ft. below top of well Date Nov 3, 1994
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes, by whom? _____
Yield _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Artest 9-10 gal./min. with stem set at 53' ft. for 2.0 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes No

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Holt Fasting Inc.
Address 10621 Todd Rd., Puyallup
(Signed) [Signature] License No. 2158

Contractor's Registration No. ADP710870J Date Nov 3 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

The Department of Ecology does NOT warrant the data and/or the information on this Well Report.
The Department of Ecology does NOT Warrant the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report



WATER WELL REPORT

Original & 1st copy - Ecology; 2nd copy - owner; 3rd copy - driller

DEPARTMENT OF
ECOLOGY
State of Washington

Construction/Decommission ("x" in circle)

Construction

Decommission ORIGINAL INSTALLATION

Notice of Intent Number WE21843

PROPOSED USE: Domestic Industrial Municipal
 DeWater Irrigation Test Well Other

TYPE OF WORK: Owner's number of well (if more than one) _____
 New well Reconditioned Method: Dug Bored Driven
 Deepened Cable Rotary Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 151 ft.
Depth of completed well 151 ft.

CONSTRUCTION DETAILS

Casing Welded 6 " Diam. from 0 ft. to 151 ft.
Installed: Liner installed " Diam. from ft. to ft.
 Threaded " Diam. From ft. to ft.

Perforations: Yes No
Type of perforator used _____

SIZE of perms in. by in. and no. of perms from ft. to ft.

Screens: Yes No K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: Yes No Size of gravel/sand _____
Materials placed from ft. to ft.

Surface Seal: Yes No To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? Yes No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 74 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level

Date of test _____

Bailer test 17 gal./min. with 27 ft. drawdown after 1 hrs.
Airstest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes No

CURRENT

Notice of Intent No. WE21843

Unique Ecology Well ID Tag No. BJN 278

Water Right Permit No. _____

Property Owner Name DAVID STANTON

Well Street Address 2917 159TH ST CT NW

City GIG HARBOR County PIERCE

Location nw1/4-1/4 ne 1/4 Sec 17 Twn 22 R 2E EWM
(s, t, r Still REQUIRED) Or WWM

Lat/Long
Lat Deg _____ Lat Min/Sec _____
Long Deg _____ Long Min/Sec _____

Tax parcel No. (Required) 0222175007

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Pipe stick up	0	1
Grey sand gravel clay wet	1	13
Grey clay	13	24
Brown sand silt wet	24	33
Brey sand gravel cley damp	33	109
Grey clay	109	136
Grey sand gravel clay	136	145
Grey coarse sand gravel water	145	151

RECEIVED

JUN 09 2016

WA State Department
of Ecology (SWRC)

Start Date 02/02/16 Completed Date 02/04/16

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller Engineer Trainee Name NIC SAMPLE
Driller/Engineer/Trainee Signature _____
Driller or trainee License No. 2770
IF TRAINEE: Driller's License No: _____
Driller's Signature: _____

Drilling Company NICHOLSON DRILLING INC.
Address PO BOX 123
City, State, Zip PORT ORCHARD, WA, 98367
Contractor's
Registration No. NICH0H1370M Date 06/06/2016

ECY 050-1-20 (Rev 02-2010) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.