

State of Washington
**REPORT OF EXAMINATION
FOR WATER RIGHT APPLICATION**

PRIORITY DATE 4/1/2009	WATER RIGHT NUMBER G1-28615
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MAILING ADDRESS EASTSOUND WATER USERS ASSOCIATION POST OFFICE BOX 115 EASTSOUND WA 98245	SITE ADDRESS (IF DIFFERENT)
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Quantity Authorized for Withdrawal or Diversion		
WITHDRAWAL OR DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
18	GPM	28

Purpose						
PURPOSE	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Municipal	18		GPM	28		01/01 - 12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
0	0	22170	1,126

Source Location			
COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
SAN JUAN	GROUNDWATER		2-SAN JUAN

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
"Klein" Well	271223009000	AFR934	37N	02W	12	SWNW	48.7105	-122.9002

Datum: NAD83/WGS84

Place of Use (See Attached Map)

Sections 11, 12, 13, 14, & 24 T37N R02W and Sections 7, 8, 18 and portions of 16, 17, 19, & 20, T37N R01W outside of Moran State Park.

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Proposed Works

8" diameter well, 228 ft deep. Well Tag number AFR934 Screened from 210-220 ft depth. The well will be connected to the distribution system required to supply water to municipal water supply customers.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Already begun	December 31, 2017	December 31, 2027

Measurement of Water Use

How often must water use be measured?	Bi-weekly
How often must water use data be reported to Ecology?	yearly
What volume should be reported?	Total Annual Volume
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm)

Provisions

Pump location

In order to ensure there is no increased likelihood of lateral intrusion of seawater into the freshwater aquifer, **the pump intake shall be set no lower than 156 ft below the top of the well casing, such that no withdrawal is possible below this level.** If EWUA feels the need to lower the pump beyond this depth for any reason, it must do so in consultation with Ecology which may require a review and alteration of this water right’s monitoring and metering requirements and further adequate measures may be required to ensure the water quality of the aquifer is not impinged.

Wells, Well Logs and Well Construction Standards

All wells constructed in the state shall meet the construction requirements of WAC 173-160 titled “Minimum Standards for the Construction and Maintenance of Wells” and RCW 18.104 titled “Water Well Construction”. Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard shall be decommissioned.

All wells shall be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the regional Department of Ecology office issuing this decision. This tag shall remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Measurements, Monitoring, Metering and Reporting

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

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Water Level Measurements

In order to maintain a sustainable supply of water, pumping must be managed so that static water levels do not progressively decline from year to year. Static water level is defined as the water level in a well when no pumping is occurring and the water level has fully recovered from previous pumping. Static water levels shall be measured and recorded monthly, using a consistent methodology. Data for the previous year shall be submitted by January 31 to the Department of Ecology.

Static water level data shall be submitted in digital format and shall include the following elements:

Unique Well ID Number

Measurement date and time

Measurement method (air line, electric tape, pressure transducer, etc.)

Measurement accuracy (to nearest foot, tenth of foot, etc.)

Description of the measuring point (top of casing, sounding tube, etc.)

Measuring point elevation above or below land surface to the nearest 0.1 foot

Land surface elevation at the well head to the nearest foot.

Static water level below measuring point to the nearest 0.1 foot.

Chloride Monitoring

By January 31st of each year, the following information shall be submitted in writing to the Department of Ecology.

April and September measurements from the subject well(s) of:

Chloride and conductivity (the chemical analysis shall be performed by a state-accredited laboratory)

Depth to static water level (with pump off long enough to allow for stabilization)

The chloride/conductivity sampling and the static water level measurement shall be conducted concurrently.

This data collection will assist the applicant and Ecology in determining if actions are necessary to prevent an increasing trend in chloride concentrations (an indicator of seawater intrusion). Preventative actions may include – reducing the instantaneous pumping rate, reducing the annual volume pumped, scheduling pumping to coincide with low tides, raising the pump intake, and/or limiting the number of service connections.

Department of Health Requirements

Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750.

Water Use Efficiency

The water right holder is required to maintain efficient water delivery systems and use of up-to-date water conservation practices consistent with RCW 90.03.005.

Proof of Appropriation

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

Schedule and Inspections

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

Findings of Facts

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

Therefore, I ORDER approval of Application No. G1-28615, subject to existing rights and the provisions specified above.

Your Right To Appeal

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

To appeal, you must do the following within 30 days of the date of receipt of this document:

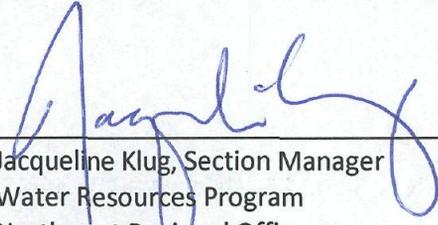
- File your appeal and a copy of this document with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this document on Ecology in paper form - by mail or in person. (See addresses below.) Email is not accepted.

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

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	Department of Ecology Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel Rd SW Ste 301 Tumwater, WA 98501	Pollution Control Hearings Board PO Box 40903 Olympia, WA 98504-0903

For additional information visit the Environmental Hearings Office Website: <http://www.eho.wa.gov>.
To find laws and agency rules visit the Washington State Legislature Website:
<http://www1.leg.wa.gov/CodeReviser>.

Signed at Bellevue, Washington, this 10th day of July 2012.



Jacqueline Klug, Section Manager
Water Resources Program
Northwest Regional Office

INVESTIGATOR'S REPORT

Application for Water Right -- Eastsound Water Users Association

Water Right Control Number G1-28615

John Rose LG, Department of Ecology

BACKGROUND

This report serves as the written findings of fact concerning Water Right Application Number G1-28615.

Table 1: Summary of Requested Water Right

Applicant Name:	Eastsound Water Users Association
Date of Application:	4/1/2009
Place of Use	Sections 11, 12, 13, 14, & 24 T37N R02W and Sections 7, 8, 18 and portions of 16, 17, 19, & 20, T37N R01W outside of Moran State Park. See accompanying map for details.

County	Waterbody	Tributary To	WRIA
San Juan	Groundwater	N/A	2-San Juan

Purpose	Rate	Unit	Acre-feet/yr	Begin Season	End Season
Domestic multiple	18	GPM	28	01/01	12/31

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
"Klein" Well	271223009000	AFR934	37N	02W	12	SW NW	48.7105	-122.9002

Legal Requirements for Approval of Appropriation of Water

Chapters 90.03 and 90.44 RCW authorize the appropriation of public ground water for beneficial use and describe the process for obtaining water rights. In order for a water right application to be approved by Ecology, the following criteria must be met:

1. Water use must not impair existing water rights
2. Water must be physically and legally available
3. Water must be put to beneficial use
4. Water use must not be detrimental to the public interest

Laws governing the water right permitting process are contained in RCW 90.03.250 through 90.03.340 and RCW 90.44.060.

Public Notice

RCW 90.03.280 requires that notice of a water right application be published once a week, for two consecutive weeks, in a newspaper of general circulation in the county or counties where the water is to be stored, diverted and used. Notice of this application was published in the Islands Sounder during the weeks of March 28, and April 4, 2012.

Consultation with the Department of Fish and Wildlife

The Department must give notice to the Department of Fish and Wildlife (WDFW) of applications to divert, withdraw or store water. On April 17, 2012, WDFW notified Ecology by letter that WDFW does not oppose the issuance of this application, and reported that while there were two small freshwater drainages in the region of this application, there was no known fish presence.

State Environmental Policy Act (SEPA)

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

- (a) It is a surface water right application for more than 1 cubic foot per second, unless that project is for agricultural irrigation, in which case the threshold is increased to 50 cubic feet per second, so long as that irrigation project will not receive public subsidies;
- (b) It is a groundwater right application for more than 2,250 gallons per minute;
- (c) It is an application that, in combination with other water right applications for the same project, collectively exceed the amounts above;
- (d) It is a part of a larger proposal that is subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA);
- (e) It is part of a series of exempt actions that, together, trigger the need to do a threshold determination, as defined under WAC 197-11-305.

Because this application does not meet any of these conditions, it is categorically exempt from SEPA and a threshold determination is not required.

INVESTIGATION

In considering this application, my investigation included, but was not limited to, research and/or review of:

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- Information supplied by the applicant
 - Washington Department of Health Sentry Database
 - Ecology water rights database and records of existing water rights in the vicinity
 - San Juan County online zoning map

- Eastsound Water Users Association website
- Russell, Robert H, 1975. *Geology and Water Resources of the San Juan Islands*. Department of Ecology, 171 pages
- Pacific Groundwater Group, 2008. *San Juan County Annual Groundwater Monitoring Report*, 47 pages
- Pacific Groundwater Group, 2008. *Interim Aquifer Protection Report, Eastsound, San Juan County, Washington*, 64 pages
- Dunn A. 2004. *Hydrogeologic Report for Change to Eastsound Water Users Association Water Rights*. Department of Ecology, 19 pages
- Russell Craig A. 2009. *Eastsound Water Users Association-Klein Production Well 2009 – Construction and Testing Report*. CR Hydrogeologic Consulting, 64 pages
- Brandon, M. T., Cowan, D.S., and Vance, J.A. 1988. *The Late Cretaceous San Juan Thrust System, San Juan Islands, Washington*. The Geological Society of America Special Paper 221, 81 pages.
- Whiteman, K.J., Molenaar, D., Bortleson, G.C., and Jacoby, J.M., 1983. *Occurrence, Quality, and Use of Ground Water in Orcas, San Juan, Lopez, and Shaw Islands, San Juan County, Washington*. U.S. Geological Survey Water-Resources Investigations Report 83-4019, 12 sheets.
- Orr L.A., Bauer, H.H., and Wayenberg, J. A., 2002 *Estimates of Ground-Water Recharge from Precipitation to Glacial-Deposit and Bedrock Aquifers on Lopez, San Juan, Orcas, and Shaw Islands, San Juan County, Washington*. U.S. Geological Survey Water-Resources Investigations Report 02-4114, 114 pages.
- Brown and Caldwell, May 2009. *Eastsound Water Users Association Water System Plan*.
- Various Geographic Information System data layers, available from the Washington Department of Natural Resources and the Department of Ecology (Ecology).

Proposed Use and Basis of Water Demand

Water right application G1-28615 has been submitted to Ecology to secure future water for the purpose of municipal use. As the designated sole water purveyor for the Eastsound community for all new development, Eastsound Water Users Association (EWUA) has determined based on a 20 year population growth projection the need to ensure additional water to meet future demand, provide for some redundancy in case of a failure of EWUA's Purdue Lake surface water source, and to reduce EWUA reliance on leased water from Eastsound Water and Sewer District (EWSD).

In 2008, EWUA completed its latest Comprehensive Water System Plan. Included as part of the planning process is a projection of future demand and a water rights self-assessment. According to the projection, the population in the EWUA service area will nearly double by the year 2028, from 2,073 to 4,065 residents. At that time, EWUA's need for water will exceed the instantaneous quantities allocated in their water rights portfolio.

Site Description

EWUA is a non-profit private water purveyor serving the Eastsound area on Orcas Island in the San Juan Archipelago within the Straits of Juan de Fuca. Orcas Island is the largest of the 175 islands within San Juan County, Washington.

Eastsound is an unincorporated community located on the northern part of Orcas Island on a narrow, relatively flat isthmus that forms a glacially carved basin separating the more hilly and mountainous eastern and western parts of the island. To the east lies Buck Mountain with an elevation of 1,500 ft. and to the Southwest lies Double Hill and Lookout Hill with elevations of 450 ft. and 690 ft. respectively. Elevations within the Eastsound area range from 0 -140 ft. above mean sea level (MSL). On the northern border of the community is the Strait of Georgia and the south is bounded by the long broad inlet (East Sound) for which the community is named after.

The Klein well is situated approximately 1,500 ft. south of the northern coast, to the east of Smugglers Cove and the Orcas Island airport, and just north of Andersen Street, on an undeveloped 30 acre lot. The well lies on the northwest slope of a gently inclined hill (See Figure 1). Table 2 provides data on the Klein well.

Total depth	230 ft.
Completion depth	228 ft.
Top of casing elevation	132.54 ft. (surveyed)
Height of casing above ground	2 ft.
Diameter	8 in.
Depth of seal	18 ft.
Screened interval	210-220 ft. depth
Static water level at time of well completion	118.65 ft.
Completion date	March 15, 2001

Hydrologic/Hydrogeologic Evaluation

Geology of the San Juan Islands

The geology of the San Juan Islands is very complex. It consists of a series of allochthonous terranes mostly of island arc and shallow marine origin of early Paleozoic to middle Cretaceous age which were accreted onto the North American continent probably prior to subsequent compressional faulting. During the late Cretaceous, imbricate thrust faulting created a series of sub-parallel nappes which generally divide each of the five identified terranes. This faulting also resulted in pervasive high-pressure metamorphism and the creation of intermittent tectonic zones along fault contacts. These units were then tilted to the southeast, probably during the Tertiary period. Subsequent advance and retreat of continental glaciers of the Vashon Stade during the Fraser Glaciation approximately 10,000 years ago deposited sequences of intermixed clay, silt, sand and gravel in low lying areas. (Russell 1975) (Brandon et al.1988)

Hydrogeology of the Eastsound Area, San Juan County, Washington

The Eastsound area consists of a complex assemblage of Jurassic to Cretaceous sedimentary, volcanic, and metamorphic bedrock overlain by a thick sequence (up to 300 ft.) of Vashon glacial deposits including permeable glacial outwash sand and gravel and more impermeable glacial till in various layers and lenses. Generally, the impermeable till overlies the more permeable outwash sand and gravel deposits. The mountains and hills to the east and southwest are comprised of bedrock and there are discontinuous bedrock outcrops along the northern shore at Terrill Beach and the spit of Point Doughty. There also is a bedrock outcrop along the southern coast along Fishing bay and Madrona Point (See Figure 2).

The Klein well was completed in water-bearing sand and gravel and silty sand and gravel strata from 213-230 ft. depth. Overlying this is approximately 150 ft. of low permeability layers of sandy silt and silty clay. Based on groundwater levels, the lithology described in both the Klein well and other logs of nearby wells, and by the CR Hydrogeologic Consultants calculation of a storage coefficient of 0.000028 (storativity for confined aquifers generally range from 0.001 to 0.00001), the area near the Klein well can be considered a very confined aquifer.

Ground Water Levels

The Department of Ecology has a monitor well located in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 11, T37N R02W, W.M., which is nearly in the middle of the delineated Eastsound aquifer and approximately 2,500 ft. from the Klein well. The monitor well is 135 ft. deep. Ecology has been measuring the water level in this well periodically from 1/6/1978 to 3/26/2009. Over this period of time the water level has fluctuated, but it has not shown there to be a declining trend and the average depth to water is around 79 feet below the top of the casing. This data shows that the aquifer is not declining and suggests that the current ground water withdrawals in the area are sustainable at least at their current rates (See Figure 3).

Static water level measurements were provided from 2001 to 2009 in the Klein well testing report by CR Hydrogeologic Consulting. Water levels in the well during this interval have fluctuated between 120 and 125 ft. below the top of the casing, which corresponds to water elevations of 7.6 to 12.6 ft. above MSL and 87 to 92 ft. above the top of the well screen indicating large head pressures in the confined aquifer. During this interval there was no indication of a declining water level trend (See Figure 4).

Static water level information proved by a data logger from May 6 through Sept 11, 2009, indicates that there are seasonal fluctuations of up to 5 feet, mostly during the months of June through mid-August. Furthermore comparisons between data logger levels taken between May 5 and May 21, 2009, and correlated with tidal data from the Friday Harbor tide gauge indicate that there is strong hydrologic continuity that causes a half a foot change in the Klein well.

The water level in the wells located near Buck Mountain (NW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 13, T37N, R02W, W.M.) show a large (~24 ft.) natural seasonal fluctuation in water levels. The water level ranges from flowing artesian from December through March and then declines to approximately 24 ft. below ground surface

in October before rising again. When the well is flowing artesian, the water level elevation is at least 40 ft. above MSL.

Aquifer Recharge and Groundwater Flow Directions

Russell (1975) reports that the source of groundwater in the San Juans is exclusively from precipitation. Due to the rain shadow of the Olympic Mountains, precipitation is not evenly distributed throughout the Islands. Much of the southern portions of the islands, such as Lopez Island and parts of Shaw Island and San Juan Island receive less than 28 inches per year, whereas the lowland northern parts of the islands can receive as much as 40 inches. The highest rainfall occurs on Mt. Constitution, to the southeast of Eastsound and Buck Mountain where average rainfall can be as much as 45 inches per year. Precipitation in the immediate area of Eastsound is between 30-32 inches per year and annual recharge occurs mostly during the wintertime, from September to April when precipitation is highest and evapotranspiration and artificial discharge is lowest (Orr et al. 2002). In the USGS recharge study by Orr et al., the primary method for estimating recharge was a daily near surface water balance method called the Deep Percolation Model. This method estimates recharge in the Eastsound area to be 3-4 inches per year for glacial unconsolidated deposits and 0.5 inches per year for bedrock.

Previous studies by AGI Technologies, CR Hydrogeologic Consulting, and Pacific Groundwater Group (PGG) show that groundwater elevations generally mimic surface elevations. Groundwater flows from the highland areas to the east and southwest toward the center of the Eastsound area and create a groundwater divide that runs from just north of the Pearson well northeast toward the Clark/Mt. Baker well and the Greer well. Studies done by consultants and Ecology staff all confirm that groundwater drains north into the Strait of Georgia probably through a bedrock gap near the marina at Smugglers Cove and that it drains south also through a bedrock gap into Eastsound at Crescent Beach (See Figure 5).

The groundwater fluctuations observed in the well field at the base of Buck Mountain suggest there is mountain front recharge occurring there. Mountain front recharge is caused by precipitation falling on uplands that does not infiltrate fully, instead a significant portion of the precipitation becomes surface water runoff that then flows downhill and infiltrates into the unconsolidated deposits found at the base of the hill or mountain. (Dunn 2004) (PGG 2008)

In 2008, PGG completed its Interim Aquifer Protection Report for Eastsound. Previously published studies, including the USGS report by Orr et al. did not take into account the possibility of mountain front recharge, and therefore estimates for total annual recharge was probably too low. PGG estimated mountain front recharge based on a water balance method that was constrained by two different estimates of effective precipitation to arrive at their conclusions.

The report concludes that the total recharge to the Eastsound aquifer is roughly 1,055 AFY (125,902 cubic feet per day as outlined in their report) based on combining the Orr et al. report's findings noted above and with their own calculation of mountain front recharge. Of this total recharge, approximately ¼ of it consists of the previously unaccounted mountain front recharge.

While mountain front recharge cannot be directly measured, based on monitor well data, geologic cross sections, topography, and the seasonal fluctuations in the Buck Mountain well field, I believe that PGG's estimates of total recharge more accurately reflects the true state of infiltration into the water-bearing strata for the Eastsound area than previous estimates. EWUA's combined existing ground water rights, plus this application and G1-28643 also being processed at this time would equal 480.25 AFY (see table 6 below) to potentially be withdrawn from the 1,055 AFY estimated average annual recharge. A survey of existing ground water right certificates in the area of the glacial deposits in EWUA's current service area yields an estimated additional 10.5 AFY being used. It should be noted that PGG's groundwater flow model and its estimates of the effects of future increased demand due to population growth has a number of limitations and assumptions that might be the cause of error. Among these is uncertainty of subsurface geology, a limited understanding of groundwater flow through the bedrock gaps to seawater, and the use of a steady state model that doesn't take into account fluctuating groundwater levels due to seasonal precipitation.

Pump Tests

There have been three pump tests conducted on the Klein well. The first test was performed on March 14, 2001, following well construction. This test was analyzed by hydrogeologist Craig Russell of CDM Water Resources Group. This test initially set a pumping rate of 50 gpm which was reduced to 41 gpm after 5½ hours. Drawdown stabilization was never reached during this test, indicating that the pumping rates were greater than the aquifer's recharge rate. CDM calculated a theoretical specific capacity of the well at 18 gpm and recommended another pump test be conducted to confirm this estimate. The well was not in use from 2001 to 2009.

A second step-rate pump test was conducted between Sept 15 and Sept 22, 2009, for 69 hours to determine the maximum sustainable pumping rate for the Klein well (where drawdown stabilized at less than 0.1 ft./hour for at least 4 hours). Initially the pumping rate was set at 10 gpm for 30 hours which stabilized after about 5 hours despite some tidal effects, and then the pumping rate was increased to 18 gpm for 39 hours. Drawdown stabilization was reached after 14 hours with a depth to water of 159 ft. from top of casing (53 ft. above well screen interval). The stabilization threshold of 0.1 ft. per hour was maintained for the next 23 hours. 75% recovery occurred after roughly 36 hours. Table 3 summarizes the results of these two tests.

Table 3: Summary of Klein Well Pump Tests

Pump Test start date	Discharge rate	Elapsed time	Drawdown	Specific capacity
March 14, 2001 (step test)	50 gpm	5.5 hours	60.97 ft.	0.82 gpm/ft.
	41 gpm	24 hours	63.42 ft.	0.65gpm/ft.
Sept 15, 2009 (step test)	10 gpm	30 hours	17 ft.	0.73gpm/ft.
	18 gpm	39 hours	33 ft.	0.62 gpm/ft.

The third and last pump test was conducted from Sept 29 to Oct 2, 2009, for 78 hours at a constant rate of 20 gpm and recovery measured for another 12 days. Water levels were measured using a data logger and manually for calibration purposes. Data was also collected in three non-operational observation wells during this test. These wells were the two exempt wells located on the Tex Beemer properties (Ecology well tag numbers AHH529 and AHH535) and the EWUA Greer Well 1 (Ecology well tag number

AGA330). A total of 93,600 gallons was pumped during this test. Table 4 summarizes some of the results of this pump test.

Table 4: Summary of Constant Rate Pump Test Sept 29 to Oct 2, 2009¹

Well	Distance from Klein (in ft.)	Ground Surface Elev. (ft. MSL)	Completion Elevation (ft. MSL)	Drawdown (in ft.) After 78 hours
Klein Well (AFR934)	0	130.33	-83 to -90	35.14
Beemer (AHH529)	400	106	-79 to -89	14.11
Beemer (AHH535)	417	107	-73 to -93	14.65
Greer (AGA330)	1,263	97	6 to -16	0.0

¹ from table 1. CR Hydrogeologic Consultants *Klein Production Well 2009 – Construction and Testing Report*.

Aquifer Characteristics

As the third pump test most closely resembles the planned usage of the Klein well plus impacts on wells in the immediate area, the results of this test will be the primary basis for determining physical water availability.

Water level hydrographs for the Klein and observation wells plus drawdown and recovery curves were provided by CR Hydrogeologic Consulting (CRHC) and are included in this report. The hydrographs show there is some continuity between the Klein well and the Beemer wells, but no discernable impact on the more distant Greer well (See Figure 6).

The time-drawdown graphs for drawdown and recovery (Figure 7) indicate a number of important characteristics of the aquifer in the vicinity of the Klein well. First, a change in the slope of the drawdown curve after approximately 1000 minutes suggests the presence of a barrier boundary or the edge of the aquifer where the transmissivity sharply decreases in the Klein well from 1,050 gpd/ft to 278 gpd/ft. CRHC suggests that this may be the result of an intersection of the well's cone of depression with a bedrock outcrop along the northern coast of the Eastsound glacial basin. Secondly, the recovery curve indicates that recharge to this portion of the aquifer is quite slow with 75% recovery occurring roughly 30 hours after the pump was shut off. Finally, a distance-drawdown graph of the wells shows that the cone of depression for the Klein well could extend beyond the northern shoreline and be a source for sea water intrusion.

Transmissivity reflects the amount of water that can be transmitted horizontally through a unit width by the full saturated thickness of the aquifer under a hydraulic gradient of 1. Calculations based on the three wells ranges from a low of 300 gpd/ft. to a high of 1500 gpd/ft. with an average of 1,100 gpd/ft. The low value derives from the barrier boundary and is most likely far lower than the actual. The calculated hydraulic conductivity, or the capacity of the aquifer to transmit water, is estimated to be 11,000 gpd/ft² to 15,000 gpd/ft² based on the average and high estimates of transmissivity. This in turn yields a theoretical potential recharge of 7.6 to 10.4 gpm (CR Hydrogeologic Consultants 2009). Specific capacity of the well is estimated to be 0.56 gpm/ft of drawdown. These results are summarized in table 5.

Table 5: Results from Constant Rate Pump Test

Specific Capacity	0.56 gpm/ft.
Average transmissivity	1,100 gpd/ft.
Hydraulic conductivity	11,000-15,000gpd/ft ²
Potential Recharge	7.6-10.4 gpm
Storage Coefficient	.000028
Optimum yield	17-20 gpm

Despite the theoretical potential recharge, the pump test indicates that the recharge rate to the portion of the aquifer in the vicinity of the Klein well is at least 20 gpm since the pumping level in the well stabilized well above the well screen. Because there was slow recharge to the well during the test, if this application is approved, Ecology recommends limiting the demand placed on this well and frequently checking the data logger recorded levels. Having the pump intake set to the 156 ft. below the top of the casing as outlined below will also help with preventing over pumping. It should also be noted that during all three tests, a strong sulfur smell was detected in the water. EWUA has indicated it plans to use aeration or chlorination to remove the odor.

Potential for seawater intrusion

Wells drilled to depths near sea level and located near the shoreline have a tendency to be subject to seawater intrusion because of their proximity to the freshwater-seawater interface (Whiteman et al. 1983). Seawater intrusion can be caused by two different phenomena. Lateral intrusion is the migration inland of the seawater/freshwater interface due to the pumping of wells and loss of head, or if a saltwater zone exists in the aquifer beneath the well, the saltwater will rise up toward the well screen in a process known as upconing. In the case of the Klein well, because the Eastsound glacial deposits are underlain by bedrock, the possibility of upconing is remote. However, because there is evidence of a natural drainage of groundwater through a bedrock gap along the north shore near Smuggler's Cove, supported by the tidal influence observed in the Klein well, the potential of lateral intrusion is a concern.

Confined aquifers that have low coefficients of storage and high transmissivity have extensive lateral cones of depression. The distance-drawdown graph provided by CRHC shows that at the requested pumping rate, this cone of depression will likely extend beyond the northern shoreline point of discharge for the aquifer, which could lead to seawater intrusion. CRHC recommends in their Klein Well Construction and Testing Report that measures be taken to ensure a positive head pressure at the point of discharge to ensure that seawater intrusion does not happen. Ecology endorses CRHC's recommendation that pumping levels in the well not fall any lower than the 156 ft. depth below the top of the casing. The best way to ensure this is to set the pump intake to this depth or higher. Since optimum yield, which is the maximum amount of water that can be pumped from a well is the product of the specific capacity and the maximum safe drawdown, if we use a depth of 156 ft. for the maximum drawdown, then the result is an optimum yield range of 17-20 gpm. This is based on the measured static water levels of 121-125 ft. below the top of the casing. Since this amount corresponds to the requested instantaneous amount of 18 gpm, there appears to be sufficient water to meet EWUA's application.

If this application is approved, sampling of the well for chloride concentrations will be a provision of the permit to ensure that seawater intrusion is not occurring.

Other Rights Appurtenant to the Place of Use

Eastsound currently holds 6 water right certificates, 2 permits, and 1 application (G1-28643 for 150 gpm, 226 AFY) that is being processed in addition to this one. Furthermore, EWUA leases two water rights from EWSD for a combined 75 gpm and 80 AFY. Table 6 outlines EWUA's current water rights and the total production in terms of instantaneous and annual quantities

Table 6: Summary of Existing Water Rights Used by EWUA

Water Right Record	Owner	Stage	Status	Priority date	Qi (gpm)	Qa (AFY)
S1-24416CWRIS	EWUA	Cert.	Primary	11/28/83	300.7 ³	223
R1-24196ALCWRIS	EWUA	Cert.	Reservoir storage	11/4/82	N/A	111.5 ⁴
G1-23903C	EWUA	Cert.	Primary	8/10/81	40	43
G1-23144C	EWUA	Cert.	Supplemental ¹	6/9/78	20	32
G1-21830C	EWUA	Cert.	Primary	6/21/74	75	100
G1-00376C	EWUA	Cert.	Supplemental ²	4/15/70	25	40
G1-27704P	EWUA	Permit	Primary	2/12/96	40	1.5
G1-27705P	EWUA	Permit	Primary	2/12/96	47	1.75
				TOTAL	547.7	369.25

¹G1-23144C is supplemental to G1-00376C, G1-21830C, G1-*03683C and G1-00438C (the last two rights owned by EWSD).

²G1-00376C is supplemental to G1-*03683C owned by EWSD

³300.7 gpm is equal to 0.67cfs which is the amount authorized on the certificate for S1-24416CWRIS.

⁴ The annual quantity for the reservation certificate is non-additive to the total water right portfolio. It merely indicates the amount of water to be stored.

In addition to these rights, there are 9 Group B water systems within the EWUA service area (PGG 2008). However, all but one of these Group B system's wells lie within the Buck Mountain area over a mile from the Klein well and are drilled in bedrock. The Group B system that is within the Eastsound glacial basin, the Eglise Estates Water System, has its well approximately 4,000 ft. from the Klein well.

Impairment Considerations

Impairment is an adverse impact on the physical availability of water for a beneficial use that is entitled to protection. The subject application cannot be approved if it would:

- Interrupt or interfere with the availability of water to an adequately constructed groundwater withdrawal facility of an existing right. An adequately constructed groundwater withdrawal facility is one that (a) is constructed in compliance with well construction requirements and (b) fully penetrates the saturated zone of an aquifer or withdraws water from a reasonable and feasible pumping lift.
- Degrade the water quality of the source to the point that the water is unsuitable for beneficial use by existing users (e.g., via sea water intrusion).

Groundwater wells that are at greatest risk of impairment are those which are completed in the same aquifer zone as the subject well, located in close proximity to the subject well, and also located hydrogeologically down-gradient from the subject well. As water in the aquifer travels toward wells that are located down-gradient from the subject well, the subject well may potentially capture this water and impair the production of down-gradient wells. An arbitrarily, yet conservatively chosen area of one-half mile (1/2-mile) from EWUA's Klein well is used to define "close proximity." This value is justified experimentally based on current and historical pump test data that show negligible drawdown, and therefore unlikely impairment to wells induced by groundwater withdrawal at distances of 1,000 feet in most cases. Table 7 shows the water rights and claims within a ½ mile radius of the Klein well.

Table 7: Water Rights and Claims within a Half Mile Radius of Application G1-28615

Water Right Number	Type ¹	Priority Date	Qi (GPM)	Qa(AFY)	Purpose ²	Water Right Owner
G1-00426CWRIS	Cert	09/07/1971	11	1.5	DM	MARLO INC.
G1-23705GWRIS	Cert	11/12/1980	25	5	DM IR	VAN WINGERDEN, H M
G1-002178CL	Claim L	NS ³	NS	NS	DG	HARRISON, JOHN E.
G1-005165CL	Claim L	NS	NS	NS	DG	FERRIS, FRANK
G1-004856CL	Claim L	NS	NS	NS	DG	LARSON, GEORGE C.
G1-068730CL	Claim L	NS	NS	NS	DG	MANGES, CAROL L.
G1-114155CL	Claim L	NS	NS	NS	DG	LE COMPTE, JOHN M.
G1-048363CL	Claim S	NS	NS	NS	DG	MAGUIRE, J.P.
G1-089734CL	Claim S	NS	NS	NS	DG IR	WEBER, CARL
G1-113478CL	Claim S	NS	NS	NS	DG	GUILFORD, EARL

¹Cert = water right certificate, Claim L = long form claim, Claim S = short form claim.

²For Purpose of use: DM = multiple domestic, IR = irrigation, DG = group domestic.

³NS means "not specified"

There are 8 ground water claims within the ½ mile radius of the Klein well. A water right claim is a statement of the beneficial use of water that occurred prior to the adoption of the water right codes and is not authorized by a state-issued permit or certificate. The Department of Ecology cannot verify the validity of these claims, as water right claims can only be confirmed in an adjudication by the Washington State Superior Court. Many of the claims represent use under the ground water exemption (RCW 90.44.050) for single or group domestic use.

All water rights and claims that are within the ½ mile radius from the Klein well are greater than 1,100 ft away. Since the Greer well was 1,263 ft away and there was no measurable impact or water level declines during the 3rd pump test, the conclusion is that there will be no impairment to existing water rights.

Water Availability

For water to be available for appropriation, it must be both physically and legally available.

Physical availability

For water to be physically available for appropriation there must be water present in quantities and

quality and on a sufficiently frequent basis to provide a reasonably reliable source for the requested beneficial use or uses. In addition, the following factors are considered:

- Volume of water represented by senior water rights, including federal or tribal reserved rights or claims;
- Water right claims registered under Chapter 90.14 RCW;
- Ground water uses established in accordance with Chapter 90.44 RCW, including those that are exempt from the requirement to obtain a permit; and
- Potential riparian water rights, including non-diversionary stock water.
- Lack of data indicating water usage can also be a consideration in determining water availability, if the department cannot ascertain the extent to which existing rights are consistently utilized and cannot affirmatively find that water is available for further appropriation.

EWUA's 2008 Water System Plan forecasts a future demand of 449 gpm and 289.7 AFY by 2028 to reflect a population growth of approximately 2,000 new residents, or nearly twice the present population. EWUA's plan initially envisioned an instantaneous shortfall of 31.3 gpm in their water rights by this date. However, the plan was published prior to Ecology's approval of the two Greer well applications (G1-27704 & G1-27705) in 2009 which are now in permit stage. Therefore current estimates of future needs should be adequately met by EWUA's current water right portfolio including surface water rights from its Lake Purdue source. However, EWUA has correctly identified the need for backup sources for its Lake Purdue source and to offset its leasing of senior water rights from Eastsound Sewer and Water District.

Based on PGG's estimates of annual recharge to the Eastsound basin, I conclude there is sufficient water physically available for approval of EWUA's application and with proper care and monitoring the withdrawal will not reduce the minimum flows necessary to prevent migration of the seawater/freshwater interface further inland.

Legal availability

To determine whether water is legally available for appropriation, the following factors were considered:

- Regional water management plans – which may specifically close certain water bodies to further appropriation.
- Existing rights – which may already appropriate physically available water.

During this investigation, there were no indications that existing rights would be impaired or any reason to deny this application based on legal availability of water.

Beneficial Use

EWUA applied for multiple domestic rights. By law, EWUA is considered to be a municipal water supplier. Municipal supply is defined in statute as a beneficial use (RCW 90.54.020(1)).

Public Interest Considerations

No detriment to the public interest could be identified during the subject investigation.

Consideration of Protests and Comments

No protests were filed against this application.

Conclusions

The Klein well appears to be able to pump the requested amounts of water while meeting the requirements of physical and legal availability, no impairment of existing water rights, beneficial use, and no detriment to the public interest.

RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend that this request for a water right be approved in the amounts and within the limitations listed below and subject to the provisions listed on pages 2-4 in the Report of Examination.

Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial:

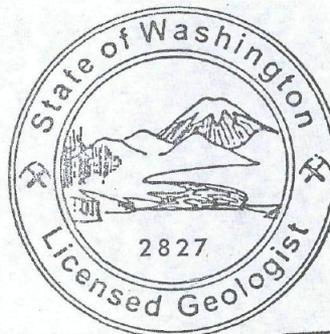
18 gpm
28 acre-feet per year
For Municipal Supply

Point of Withdrawal:

SW $\frac{1}{4}$, NW $\frac{1}{4}$, Section 12, Township 37 North, Range 02 West, W.M.

Place of Use

Sections 11, 12, 13, 14, & 24, T37N R02W, and Sections 7, 8, 18, and portions of 16, 17, 19, & 20, T37N R01W, W.M., outside of Moran State Park.



JOHN M. ROSE

John M. Rose

7/10/2012

John M. Rose, Licensed Geologist No. 2827

Date



J. R. "BUCK" SMITH

Buck Smith

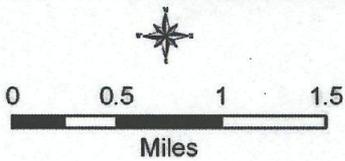
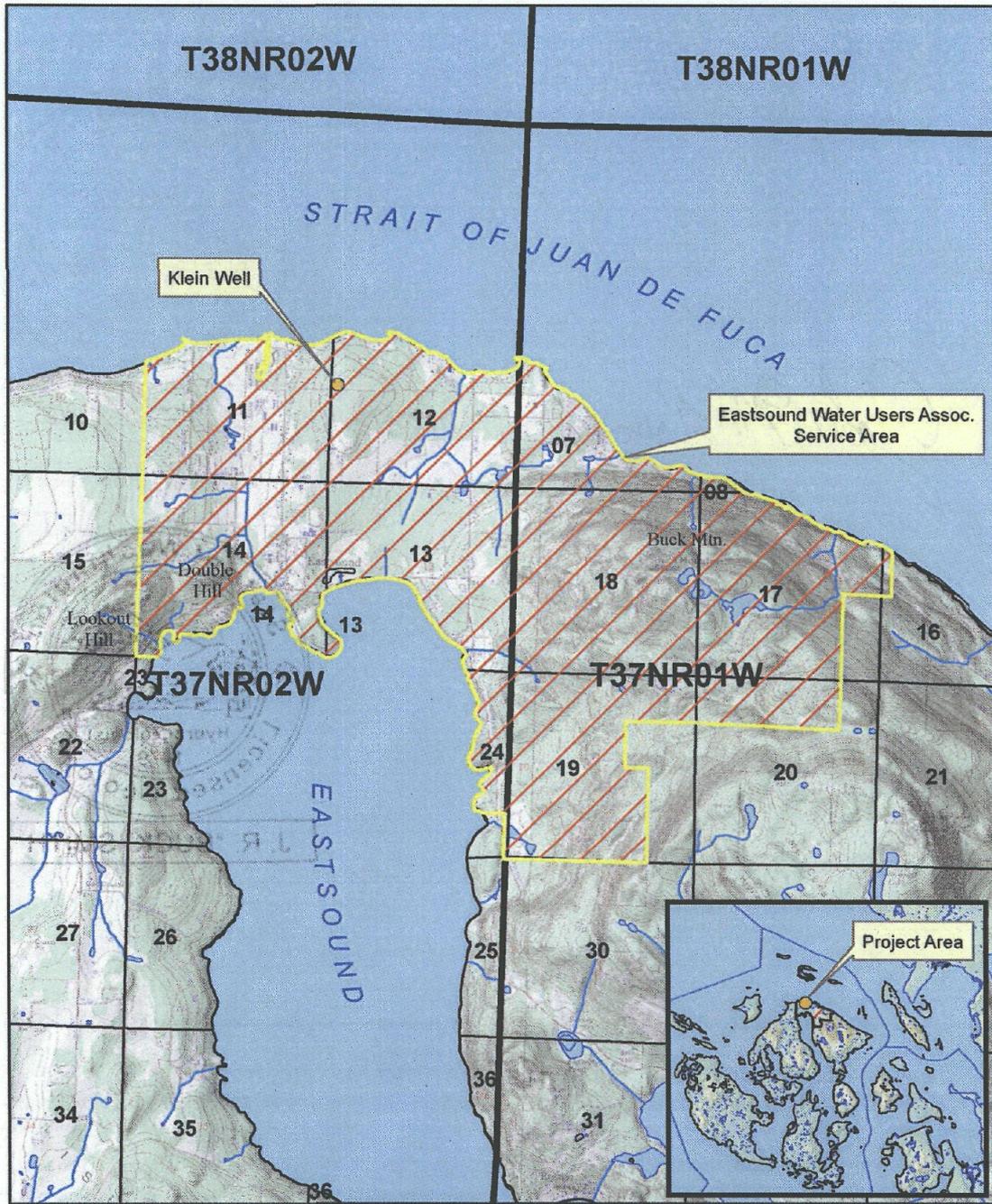
7/10/2012

Reviewed by Buck Smith, Licensed Hydrogeologist No.

Date

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Water Right Application
G1-28615 Eastsound
Water Users Assoc.
 San Juan County, WA



Figure 1

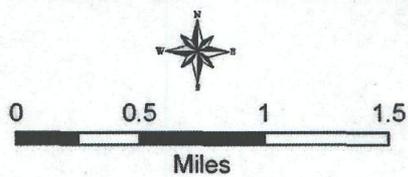
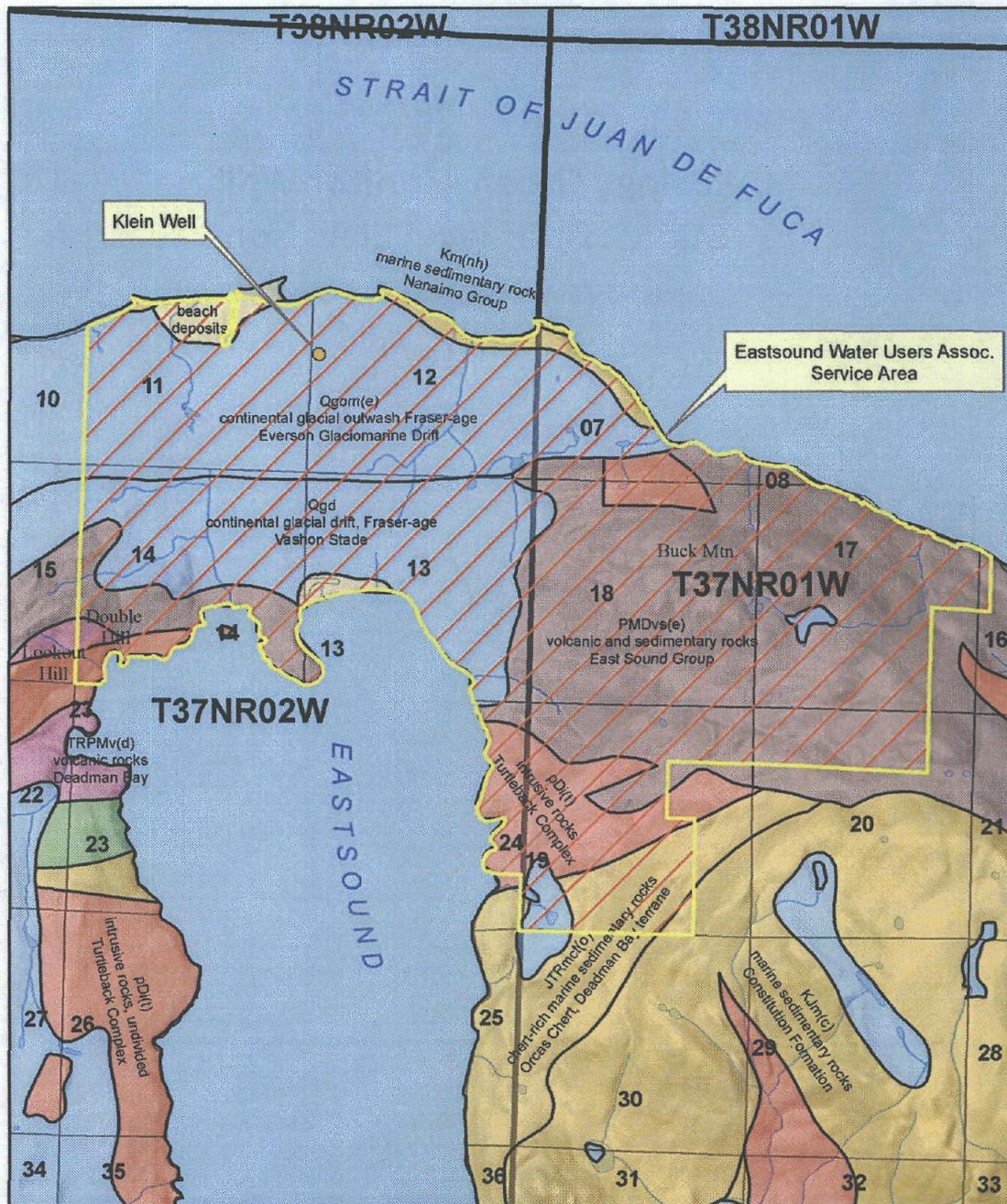


Figure 2

3/20/2012



**Geologic Map for
G1-28615**

Eastsound Water Users Assoc.
San Juan County, WA

Ecology Green Monitor Well Static Water level Elevation above Mean Sea Level

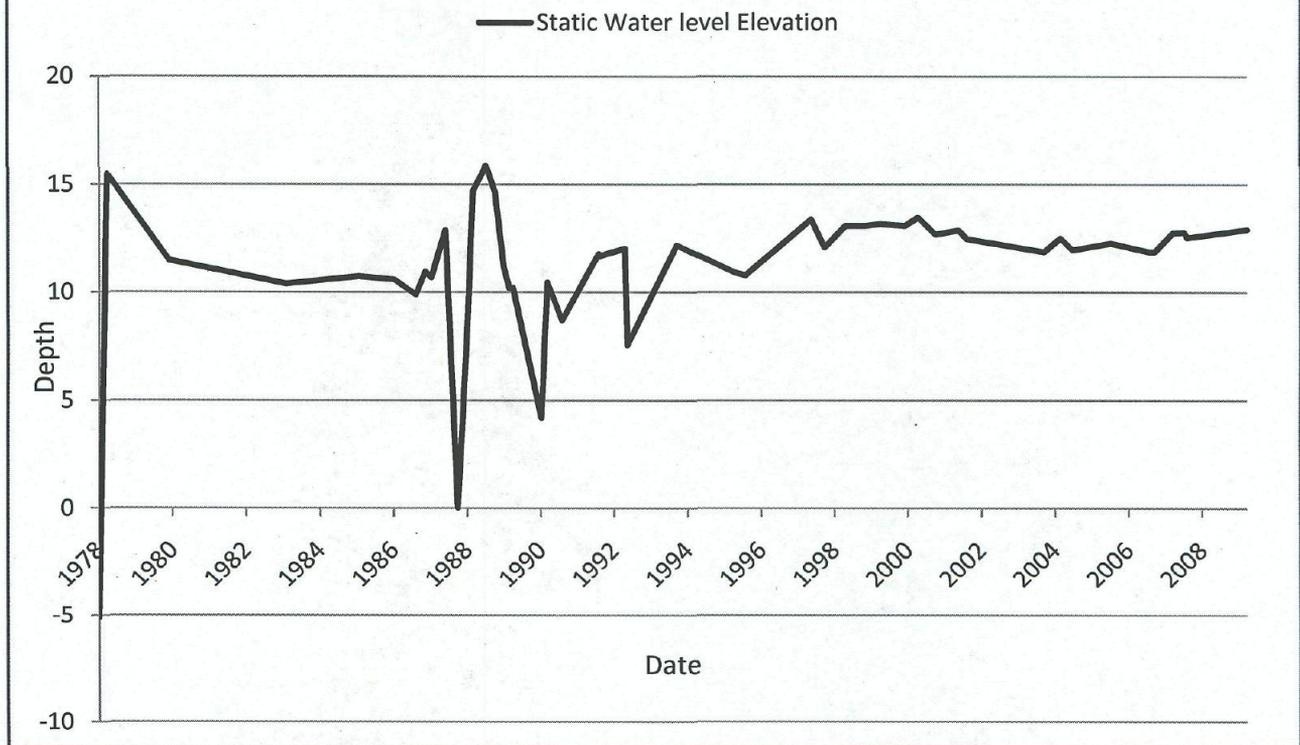


Figure 3

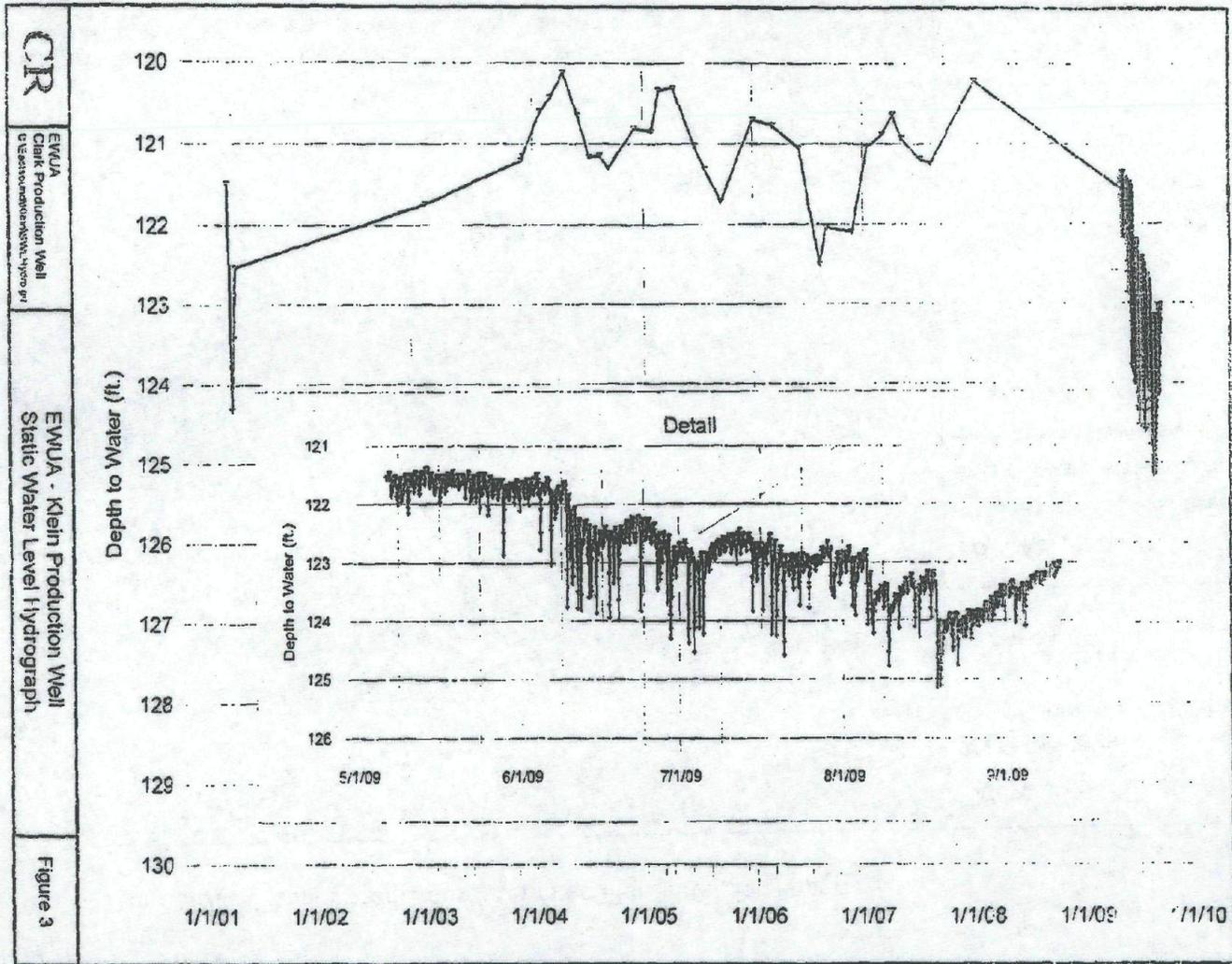
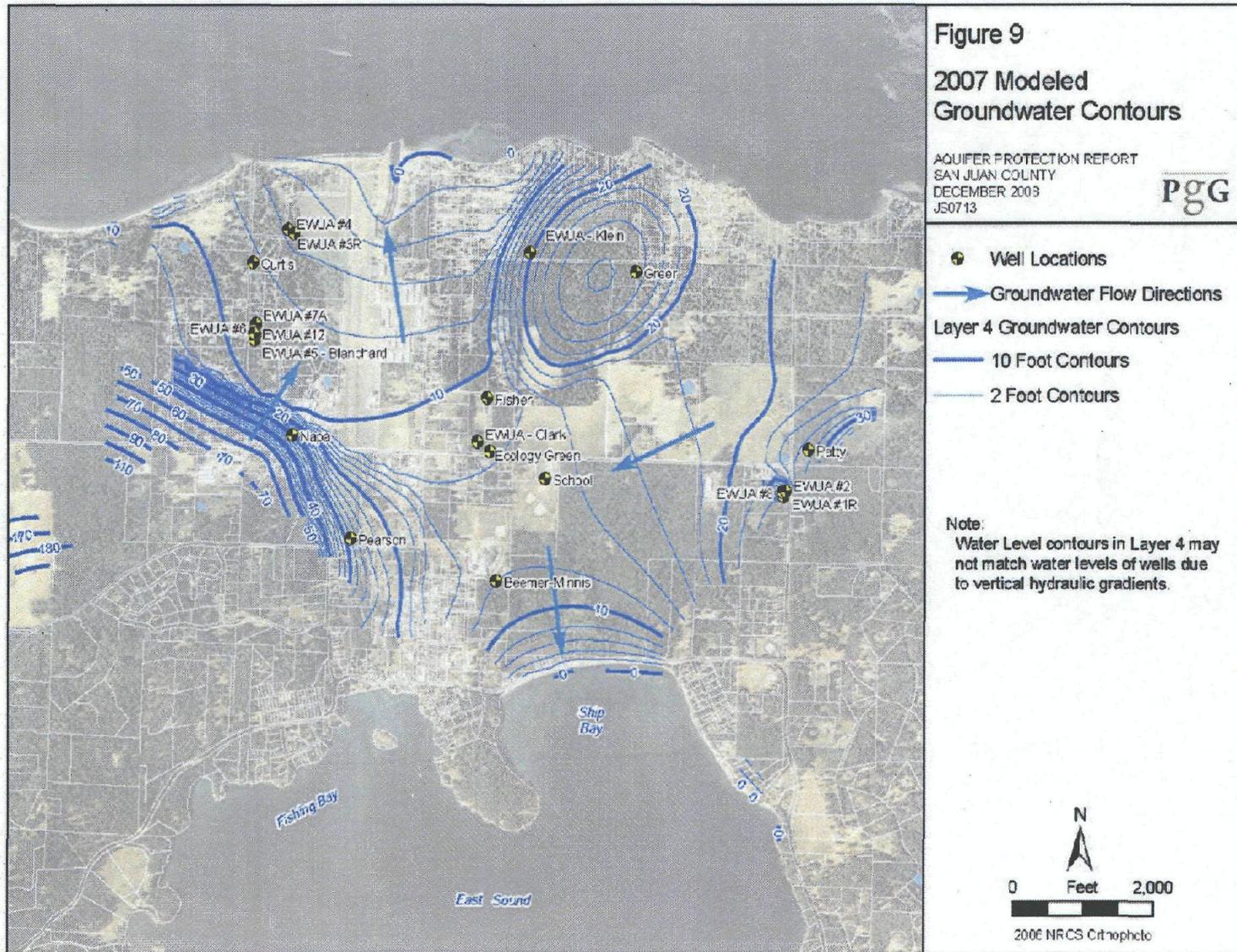


Figure 4
From CR Hydrogeologic Consultants Klein Well Construction and Testing Report

Figure 5
From Pacific Groundwater Group Interim Aquifer Protection Report



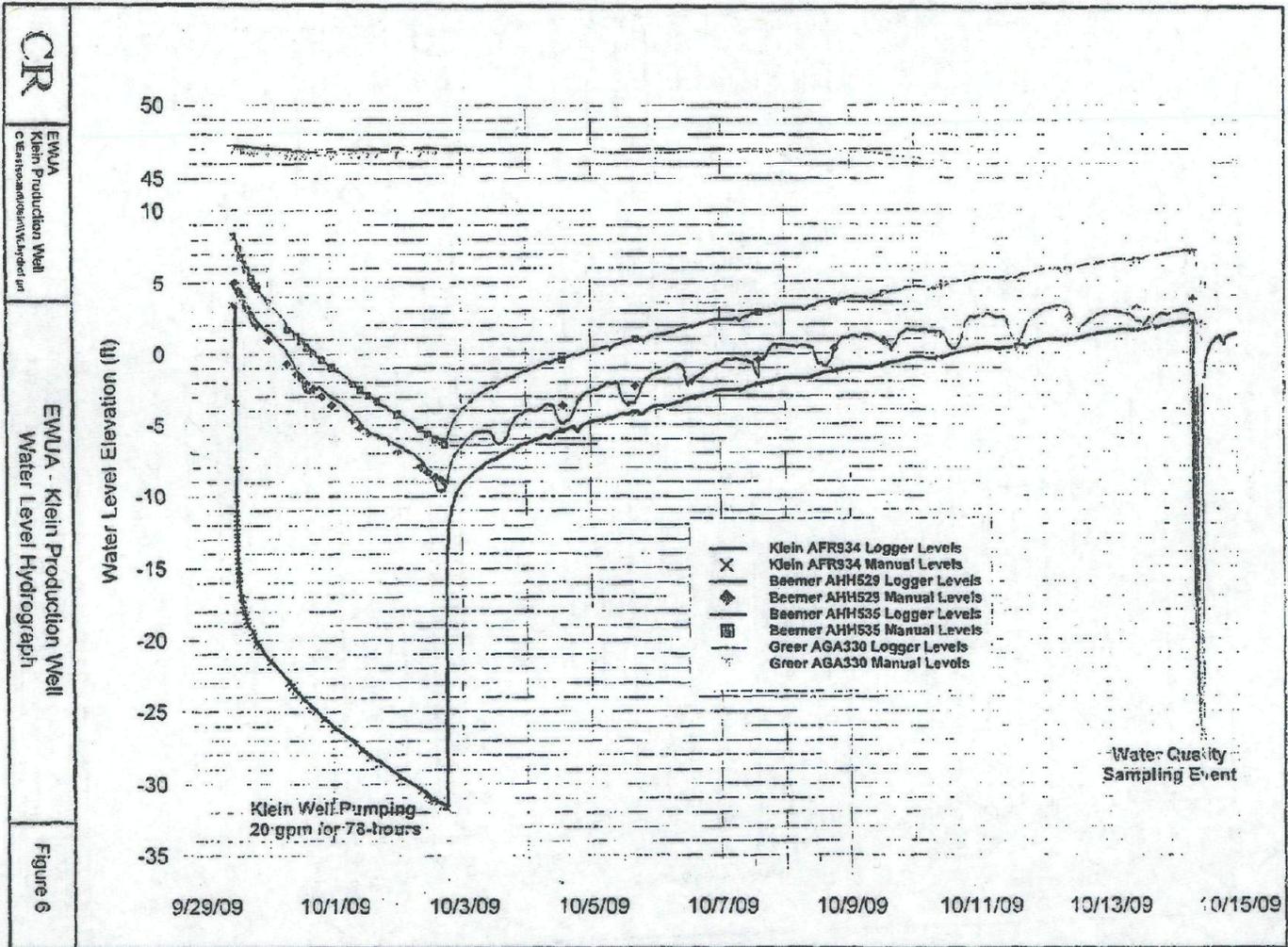


Figure 6
From CR Hydrogeologic Consultants Klein Well Construction and Testing Report

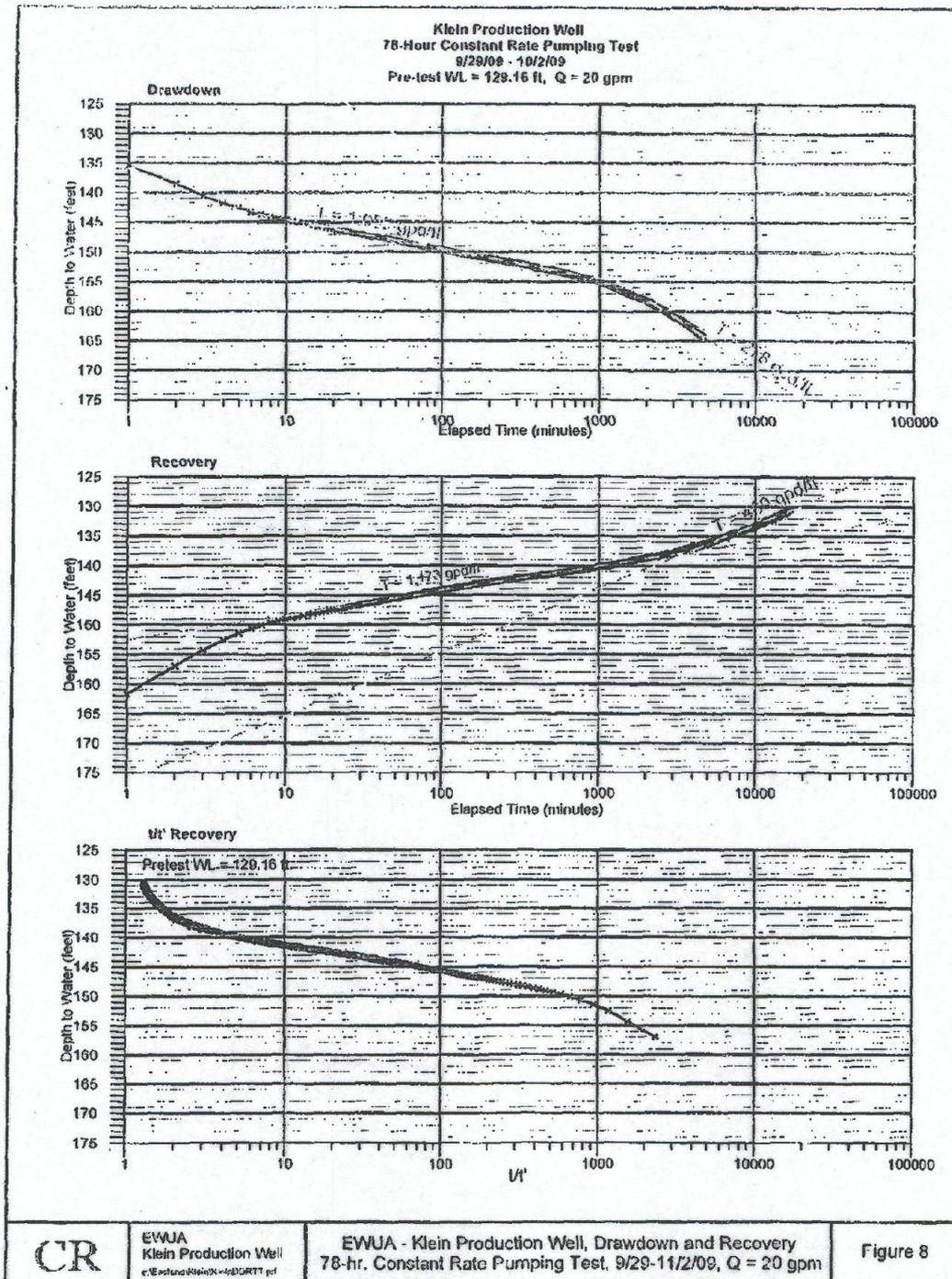
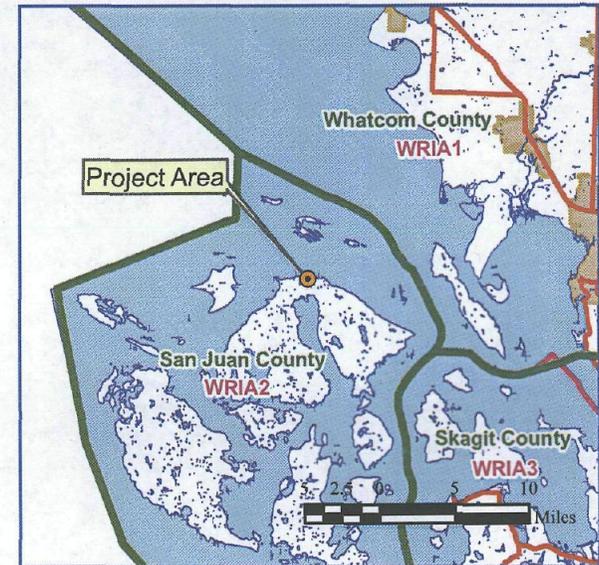


Figure 7
 From CR Hydrogeologic Consultants Klein Well Construction and Testing Report

Eastsound Water Users Association
 Water Right Number G1-28615
 Sec 12 T 37N R 02W W.M.
 WRIA2 - San Juan County



Legend

- WRIA
- Highways
- Townships
- Sections
- cities
- Parcels2007
- Major Water Bodies
- Marsh/wetland
- WL
- Certificated Place of Use



Place of use and point(s) of diversion/withdrawal are as defined on the cover sheet under the headings, 'LOCATION OF DIVERSION/WITHDRAWAL' and 'LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED.'

Proposed Point of Withdrawal

Authorized Place of Use

