WR File NR: CS4-24994C
WR Doc ID: 4924420

DEPARTMENT OF ECOLOGY
State of Washington

State of Washington
REPORT OF EXAMINATION
FOR WATER RIGHT CHANGE

Add Point of Withdrawal

PRIORITY DATE	WATER RIGHT NUMBER
March 15, 1977	S4-24994C
	CHANGE APPLICATION NUMBER
	CS4-24994C

MAILING ADDRESS	SITE ADDRESS (IF DIFFERENT)
William Small/G.R. Small & Son Orchards **4660 Entiat River Rd** **Entiat, WA 98822-9790**	**4103 Entiat River Road** **Entiat, WA 98822**

Total Quantity Authorized for Withdrawal or Diversion

WITHDRAWAL OR DIVERSION RATE	UNITS	ANNUAL QUANTITY (AF/YR)
1.5	cfs	43.86

Purpose

	WITHDRAWAL OR DIVERSION RATE			ANNUAL QUANTITY (AF/YR)		
PURPOSE	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	PERIOD OF USE (mm/dd)
Irrigation of 8.6 acres	0.2		cfs	43.86		Mar 1 – Oct 1
Frost Protection	1.3		cfs	4		On Demand

REMARKS

The application is to add a point of withdrawal (Irrigation Well BCA945) located on the same parcel (252013140100) as the existing point of diversion and place of use. The original certified surface water right permits the use of 0.20 cfs and 51 af/yr for irrigation of 10 acres. A review of aerial photos indicates that the irrigated area is approximately 8.6 acres. The existing surface water diversion will be maintained to provide 1.3 cfs of frost protection as needed and/or an emergency backup for irrigation in the event of well failure.

IRRIGATED ACRES	
ADDITIVE	NON-ADDITIVE
8.6	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
Chelan	Entiat River	Columbia River	Enitat WRIA 46

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWN	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Irrigation Well	252013140100	BCA945	25N	20E	13	SE NE	47.66571°	120.26627°
Entiat River	252013140100	--	25N	20E	13	SE NE	47.66546°	120.26598°

Datum: WGS84

Place of Use (See Attached Map)

PARCELS (NOT LISTED FOR SERVICE AREAS)

Parcel 252013140100 in the SE¼ of the NE¼ of Sec. 13, T. 25 N., R. 20 E.W.M; and in the W½ of the NW¼ of the SW¼ of the NW¼ of Section 18, T.25 N., R. 21 E.W.M., Chelan County

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

Beginning at a point on the north bank of the Entiat River in Southeast quarter of Northeast quarter, Section 13, Township 25 North, Range 20 E.W.M., on line north and south of the concrete monument marking the boundary line between property of McArthur and Auvil as agreed upon in Deed recorded in Book 97, page 436; thence north on said boundary line 717 feet to the south line of the Permanent Highway No. 4; thence west 375 feet; thence south parallel to east line 470 feet to north bank of Entiat River; thence southeasterly along the north bank of the Entiat River to the place of beginning.

Beginning at a point of Southerly line of Entiat Light and Power Company – ditch right of way across Section 13, Township 25 North, Range 20 E.W.M., 643.5 feet west of east line of said Section 13; thence running south on a line parallel to section line a distance of 410 feet; thence north 83° 30' East a distance of 87.2 feet; thence north 179 feet; thence North 82° East about 829 feet to a point 214.5 feet east of east line of said Section 13; thence north to southerly line of Entiat Light and Power Company's ditch right of way; thence westerly along said ditch right of way line to point of beginning. That certain tract of land lying between the east and west line of two tracts above described and south of northerly line of said tracts of land extended easterly and westerly and north of a line connecting the said 2 tracts, which line is 410 feet south of northerly line of said 2 tracts of land.

EXCEPT tract conveyed by Deed recorded in Book 93, page 250.

Proposed Works

The added Irrigation Well (Unique Well ID BCA945) was drilled in October 2011 with 8-inch-diameter casing to 43 feet. The existing irrigation system for the property consists of 3- and 6-inch-diameter underground pipes connected to above-ground sprinklers. Typical sprinkler heads are under-tree ½-inch Nelson R10 types. A small area near Entiat River Road is irrigated using overhead impact sprinklers. The existing surface water diversion will remain for frost protection use and/or as an emergency backup for irrigation in case of well failure.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Begun	Completed	October 1, 2015

Measurement of Water Use

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

Provisions

Well Decommissioning

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. The existing dug, the unused 12-inch well and a third well (Unique Well ID BCC648) shall be decommissioned.

Fish Screening Criteria
The intake(s) shall be screened in accordance with Department of Fish and Wildlife screening criteria (pursuant to RCW 77.57.010, RCW 77.57.070, and RCW 77.57.040).

Department of Fish and Wildlife
Attention: Habitat Program
600 Capitol Way N
Olympia, WA 98501-1091

Phone: (360) 902-2534
Email: habitatprogram@dfw.wa.gov
Website: http://wdfw.wa.gov/conservation/habitat/planning/screening/

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

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

Proof of Appropriation
The water right holder must 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 superseding 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, will 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.

Real Estate Excise Tax
This decision may indicate a Real Estate Excise Tax liability for the seller of water rights. The Department of Revenue has requested notification of potentially taxable water right related actions, and therefore will be given notice of this decision, including document copies. Please contact the state Department of Revenue to obtain specific requirements for your project.

Department of Revenue
Real Estate Excise Tax
PO Box 47477
Olympia WA 98504-7477

Phone: (360) 570-3265
Internet: http://dor.wa.gov/
E-mail: REETSP@DOR.WA.GOV

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. CS4-24994C subject to existing rights and the provisions specified above.

Your Right To Appeal

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

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

File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

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

Address and Location Information	
Street Addresses	**Mailing Addresses**
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 111 Israel Road SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **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://www.leg.wa.gov/CodeReviser

Signed at Yakima, Washington, this 18 day of MARCH, 2014.

Mark Kemner, LHG, Section Manager
Water Resources Program/CRO

If you need this document in an alternate format, please call the Water Resources Program at 509-575-2490. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

INVESTIGATOR'S REPORT

BACKGROUND

On August 10, 2011, William Small of G.R. Small & Son Orchards submitted an Application for Change/Transfer of Water Right to the Washington State Department of Ecology (Ecology). The application was assigned Change Application No. CS4-24994C. Small proposes to add a point of withdrawal (POW) from a new well located within the place of use (POU) and approximately 115 feet upstream of the existing point of diversion (POD). Attributes of the existing Water Right and the Application for Change are presented below in Table 1.

Table 1: Attributes of the Existing Water Right and Proposed Change

Attributes	Existing	Proposed
Name	J.K McArthur & Son, Inc.	William Small/G.R. Small & Son Orchards
Priority Date	March 15, 1977	March 15,1977
Change Application Date	N/A	August 10, 2011
Instantaneous Quantity	0.20 cfs – Irrigation 1.3 cfs – Frost Protection	90 gpm – Irrigation 1.3 cfs – Frost Protection
Annual Quantity	51 acre-feet – Irrigation 4 acre-feet – Frost Protection	51 acre-feet – Irrigation 4 acre-feet – Frost Protection
Purpose of Use	Irrigation and Frost Protection	Irrigation and Frost Protection
Period of Use	March 1 to October 1	March 1 to October 1
Place of Use	SE¼NE¼ of Sec. 13, T. 25 N., R. 20 E.W.M., and W½ NW¼ SW¼ NW¼ Sec. 18, T. 25 N., R. 21 E.W.M., Parcel 252013140100	same
Point of Diversion	Entiat River, SE¼NE¼ of Sec. 13, T. 25 N., R. 20 E.W.M., Parcel 252013140100	Entiat River (same), and Well in SE¼NE¼ of Sec. 13, T. 25 N., R. 20 E.W.M., Parcel 252013140100
Irrigated Acres	10	10

Stated in a letter from Trout Unlimited accompanying the Change Application, the POD change is part of a larger effort being conducted by the Cascadia Conservation District decrease direct diversions from the Entiat River. The biological benefits to this are numerous and important to the long-term management goals for the Entiat River as laid out in the Entiat (WRIA 46) Watershed Plan. The intent is to fully use the groundwater source and only use the surface water source for frost protection and/or in case of emergency such as well failure.

Legal Requirements for Proposed Change

The following is a list of requirements that must be met prior to authorizing the proposed Change Application No. CS4-24994C.

Public Notice
A public notice of the Change Application must be published in a local newspaper once a week for two consecutive weeks (RCW 90.03.280). The public notice of Change Application No. CS4-24994C was published in the Wenatchee World during the weeks of December 27, 2012 and January 3, 2013.

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

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

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

Water Resources Statutes and Case Law
Based on the provisions of RCW 43.21A.690 and RCW 90.03.265, this Change Application has been processed by Licensed Hydrogeologists with GeoEngineers, Inc. under Ecology Cost-Reimbursement Agreement No. GEO005 (master contract No. C1000187).

RCW 90.03.380(1) states that a water right that has been put to beneficial use may be changed. The point of diversion, place of use, and purpose of use may be changed if it would not result in harm or injury to other water rights.

The Washington Supreme Court has held that Ecology, when processing an application for change to a water right, is required to make a tentative determination of extent and validity of the claim or right. This is necessary to establish whether the claim or right is eligible for change. *R.D. Merrill v. PCHB* and *Okanogan Wilderness League v. Town of Twisp.*

Administrative Status of Surface Water Bodies
Surface water bodies in the region are subject to administrative regulations governing the right to withdraw water for beneficial use. Minimum instream flow regulations for the Entiat watershed (Water Resource Inventory Area [WRIA] 46) have been adopted in WAC Chapter 173-546. Maximum future water right allocations in the Entiat River basin have been established for May 1 through July 15.

INVESTIGATION

The examination of the Application for Change of Surface Water Right No. S4-24994C submitted by William Small/G.R. Small & Son Orchards was led by consultants from GeoEngineers, Inc. contracted as part of Ecology's cost reimbursement program to facilitate the processing of the application. Kelsey Collins of the Water Resources Program, Ecology (Central Region), oversaw the examination and provided review.

The investigation included, but was not limited to, the review of:

- The State Water Code, specifically Title 173 Washington Administrative Code (WAC) and Title 90 Revised Code of Washington (RCW).
- United States Geological Survey (USGS) topographic maps.
- Washington State Department of Ecology, 2012, Washington State Well Log Viewer website, <http://apps.ecy.wa.gov/welllog/index.asp> (Accessed November 2012).
- Washington State Department of Ecology, 2012, Water Rights Tracking System (WRTS) website <http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html> (Accessed November 2012).
- Kirk, T., P. Kerr, and H. Riddle, 1995, Draft: Initial Watershed Assessment, Water Resources Inventory Area 46, Entiat River Watershed. Washington Department of Ecology Open File Report 95-02.
- Long, W. A., 1951, Glacial Geology of the Wenatchee-Entiat Area, Washington. Northwest Science 25, 3–16.
- Tabor, R. W., V. A. Frizzell, Jr., J. T. Whetten, R. B. Waitt, D. A. Swanson, G. R. Byerly, D. B. Booth, M. J. Hetherington, and R. E. Zartman, 1987, Geologic Map of the Chelan 30-Minute by 60-Minute Quadrangle, Washington. Map 1-1661. U.S. Geological Survey. Miscellaneous Investigations Series.
- Chelan County Conservation District (CCCD), October 2004, Entiat Water Resources Inventory Area (WRIA) 46 Management Plan.
- Walker, K., 2009, Technical Memorandum: Hydrogeologic technical analysis for Water Right Change Application Nos. CS4-069703CL@1, CS4-069703CL@2, CS4-069703CL@3, CS4-069703CL@4 and CS4-069703CL@5, Chelan County, Washington. Report by Kurt Walker and reviewed by Thomas Mackie.
- Schroeder, D. R., 1987, Analytical Stream Depletion Model: Ground Water Software Publication No. 1, Office of the State Engineer, Colorado Division of Water Resources.
- Google Earth aerial photographs from 1998, 2005, 2006, 2009 and 2011.
- Photocopies of aerial photographs of the Entiat River area from 1965, 1988 and 1994 were obtained from the Chelan County Assessor's office in Wenatchee.
- Photocopies of 1945 aerial photographs were provided by Ecology.
- Information submitted by and conversations and/or meetings with the applicant William Small, Kurt Hosman of Cascadia Conservation District and Jason Hatch of Trout Unlimited.
- A site visit on December 4, 2012.

History of Water Use

The G. R. Small & Son Orchards are irrigated using surface water from a diversion located about 500 feet southwest of the driveway/access road at 4660 Entiat River Road. The Surface Water Right No. S4-24994C has a priority date of March 15, 1977. According to the permit, the property had historically been supplied with surface water diverted by Chelan County Public Utility District #1 from the former Entiat Light and Power Company Canal, located approximately 0.5 miles upstream. This source became problematic for the irrigation system because of silt and debris. A new diversion of the Entiat River was constructed at the Small property. The surface water was diverted and pumped with a 30-hp vertical turbine pump under No. S4-24994C.

The change request is to add a POW to the existing POD. The added POW is an existing single 8-inch-diameter irrigation well (Unique Well ID BCA945) located approximately 35 feet from the left bank of the Entiat River and approximately 115 feet upstream of the POD (see Attachment 1).

Proposed Point of Withdrawal

The proposed new POW is an 8-inch-diameter well drilled in October 2011 to 43 feet and screened with 0.10-inch-slotted stainless steel screen from 30 to 40 feet. The existing irrigation system for the property consists of 3- and 6-inch-diameter underground pipes connected to above-ground sprinklers. Typical sprinkler heads are under-tree ½-inch Nelson R10 types. A small area near Entiat River Road is irrigated using overhead impact sprinklers. The intent is to use the new POW as the main source and the POD is to be used only in the case of emergency, such as well pump failure.

Site Visit

Joel Purdy, Senior Hydrogeologist with GeoEngineers, conducted a site visit on December 4, 2012. William Small provided a tour of the POU, POD, POW and irrigation system. The locations of the facilities were recorded using a GPS mapping system. Photographs were also taken of facilities.

The surface water is obtained from diversion of the Entiat River (the POD). The POD is located at the upstream end of a 100-foot manmade side channel that includes a vertical turbine pump and 6-inch-diameter pump column, with a square stilling-well and fish screen. The groundwater is to be pumped from the POW (Irrigation Well BCA945), located approximately 125 feet northwest of the POD, through 3-inch-diameter pipe to the existing irrigation water system of buried pipes.

On-ground ½-inch "R10" sprinklers observed in the area of newly planted trees in the western portion of the orchard are used on most of the orchard, with the same ½-inch sprinklers observed above and below the trees within the rest of the orchard. A 3-inch totalizing flow meter was observed at the wellhead and it read 003228000 gallons. The Irrigation Well was not pumping at the time of the visit.

Three additional unused wells were observed on the Small property. An additional irrigation well (BCC648) was drilled in June 2011 to 42 feet and did not encounter adequate water. The well, located approximately 35 feet north of the POD, was later deepened to 240 feet with a similar result. The well is now capped and unused. A 12-inch-diameter well was observed near the access road. The well is not tagged and no well log was correlated to it. This well has never been used according to Mr. Small. A dug well located approximately 35 feet west of the 12-inch-diameter well reportedly served the house that was once on the parcel and still has a pump installed. It is not connected to any water system. Mr. Small said that both the 12-inch-diameter and dug wells are likely about 40 feet deep.

Extent and Validity

Aerial photographs from 1945 to 2011 were obtained from public sources. These photographs were reviewed to assess the areas irrigated after 1967 per RCW 90.14.160. Based on the aerial photographs and the site visit, there are currently three areas of irrigation on the Small parcel:

1) A block of mature orchard to the east of the property access road: 4 acres.
2) Newly planted fruit trees west of the access road driveway: 4.2 acres.
3) Landscape irrigation around storage and parking: 0.4 acres.

Areas 1, 2 and 3 total approximately 8.6 acres.

It appears that both Areas 1 and 2 have been irrigated continuously for the period of aerial photography. It appears that mature fruit trees were removed from the western (Area 2) and central portions of the parcel and replanted between 1998 and 2005. Between 2006 and 2009, the replanted trees appear to have been removed again and only the western portion was replanted by 2009. There was no definitive evidence found to indicate that irrigation was discontinued for any 5-year period.

Area 3 is in the central portion of the parcel east of the north-south access road that was once planted, but since 1988 there have been trees off and on. Since at least 2009, it has been cleared and mainly used for storage and parking. Approximately 0.4 acres have been consistently irrigated.

The irrigated areas estimated above have been irrigated continuously for the last 5 years and consistently prior to that based on the review of historical aerial photos. For the Entiat watershed, the average monthly and seasonal irrigation water usage was estimated for fruit tree irrigation in WAC 173-546-070 (Table 4-15). The estimates were for an average condition and for 65 percent application efficiency. Use for the irrigation of a pear orchard is 3.11 to 4.78 acre-feet per season per acre (af/ac). Thus, for the average water use at the G. R. Small and Son Orchards:

8.6 ac of orchard x 3.11 af/ac = 26.75 af
Total Annual Consumptive Quantity (ACQ) = 26.75 af

For 65 percent application efficiency:

8.6 ac of orchard x 4.78 af/ac = 41.11 af
Total ACQ = 41.11 af

For the original Water Right, a 5.1 af/ac irrigation rate based on a 30 percent efficiency loss on 10 acres was used to arrive at an annual irrigation usage of 51 af/yr. Applying the same 5.1 af/ac rate to 8.6 ac equals 43.86 af/yr, which is a reasonable annual quantity.

Other Water Rights Appurtenant to the Place of Use

Information on water rights in the Entiat River valley was obtained from Ecology's Water Resources Explorer online database. No claims or other water rights were found on Ecology's water right database website for the POU.

There are no surface water or groundwater rights downstream of the Small right. There are two surface water claims and six groundwater claims downstream within the Entiat River Valley.

Hydrogeologic/Hydrologic Evaluation

The following is a discussion of the hydrogeologic and hydrologic characteristics in the vicinity of the Change Application.

Well Location

The Small Irrigation Well is located about 40 feet from the left bank of the Entiat River and about 500 feet from a potential domestic well (not observed) associated with the residence to southeast of the Small well. The groundwater level in the Small Irrigation Well is reported on the log at a depth of 4 feet.

Hydrologic Setting

The Entiat River originates from the eastside of the Cascade Mountains, flows southeast through the valley between the Chelan and Entiat Mountains, and joins the Columbia River about 9.5 river-miles (RM) downstream near Entiat, WA. A large portion of the annual precipitation in the basin falls as snow and forms the winter snowpack. Spring temperatures and rain release water accumulated in the snowpack. The snowpack runoff is the dominant source of streamflow and groundwater recharge in the basin. For the USGS stream gage (#12453000) at Entiat (RM 0.5) from 1911 through 1925 and 1951 through 1958, the mean annual flow ranged from 275 to 800 cfs, peak annual flow ranged from 1,100 to 10,800 cfs and the 7-day mean low-flow ranged from 45 to 120 cfs (CCCD, 2004). The Entiat River gage was moved to near Keystone (#12452990 at RM 1.4) in 1996. Runoff is highly variable within the watershed. Data from the USGS gage near Ardenvoir (#12452800) show that in the water year 1972 the annual streamflow was 451,140 af. The next year the flow was 178,970 af (Kirk et al., 1995).

Geologic Setting

The deeply incised Entiat River Valley is underlain by metamorphic and plutonic bedrock that is overlain by volcanic ash, regolith, and unconsolidated glacial and alluvial sediments. The bedrock was formed before the Tertiary period and consists mainly of gneiss, amphibolite, tonalite, gabbro, schist, marble and quartzite. The hillslopes at both sides of the river are mainly composed of tonalite and tonalite gneiss of the late Cretaceous Entiat Pluton (Tabor et al., 1987).

The unconsolidated sediments within the Entiat River Valley include glacial tills and outwash originating from the Peshastin and Leavenworth Stage glaciers during the last Ice Age (Long, 1951) and younger surficial alluvium. The sediments mainly contain moderately sorted cobbles or sand and gravel (Long, 1951; Tabor et al., 1987). Below Ardenvoir, where the subject area is located, the valley is generally unglaciated and the unconsolidated deposits are generally reworked glacial material and alluvium consisting of moderately sorted cobbles, sand and gravel that overlie the bedrock. The thickness of the unconsolidated deposits is typically between 50 and 100 feet within the unglaciated portion of the Entiat River valley (Kirk et al., 1995).

Hydrogeologic Analysis

The Entiat River Valley forms a laterally bounded system with groundwater in the alluvial flood plain in direct hydraulic continuity with the Entiat River. The aquifer tapped by the Small Irrigation is comprised of 30 to 40 feet thick deposits of unconsolidated alluvium. Water that is pumped from the Small Irrigation Well is derived in part from the river, and causes drawdown in the aquifer that intercepts a portion of (or reduces) groundwater discharge from the aquifer as baseflow to the river. Consequently, the net effect on river flow of changing to a groundwater source is generally less than if all the water came directly from the river, as is the case with the existing surface water diversion.

Estimates for transmissivity of the unconsolidated deposits in the upper Entiat River Valley range from 12,000 to 60,000 gallons per day per foot (gpd/ft) based on analysis of pumping test data (Kirk et al., 1995). An irrigation well located less than 1,000 feet east of the Small Irrigation Well was pumped at 90 gpm with 31.28 feet of drawdown. These test data suggest a high transmissivity at the Small location as seen in the upper valley.

Impairment

The only pumping test data available for the Small Irrigation Well is what is provided on the Ecology well log. The test data reported on the well log indicates that the well was air-lifted at 40+ gpm for 1 hour. However, aquifer transmissivities are assumed to be high based on pumping tests conducted elsewhere in the valley. An analysis of potential impairment was conducted assuming an aquifer transmissivity of between 12,000 and 60,000 gpd/ft. The interference drawdown at a distance of 500 feet is expected to be less than 1 foot based on image well theory taking into account the positive boundary of the river and the negative boundary of the valley walls. Thus, the use of the Small Irrigation Well at a rate of 90 gpm will not impair other groundwater or surface water users in the vicinity based on available information.

Same Source Consideration

To change from a point of diversion to a point of withdrawal, the well must be in direct hydraulic continuity with the original surface water source. Direct hydraulic continuity exists when, as a result of pumping the proposed well, additional water from the original surface water source will flow into and recharge the aquifer where it can eventually be captured as groundwater. Additionally, the proposed well must be located and constructed such that, within a short time after pumping starts, the majority of the pumped water should be derived from, or replaced by, the surface water source; and within a short time after pumping stops, the groundwater that has been removed from aquifer storage should be replaced by infiltration from the surface water source. This requirement ensures that the POW can be managed in the same manner as the POD. An analytical groundwater flow model that included representation of the river was used to evaluate the hydraulic relationship between the original source of water and the proposed well.

The Integrated Decision Support Alluvial Water Accounting System (IDS AWAS) was used to compute amount and timing of pumping-induced stream flow depletion from operation of the proposed well based on the Analytical Stream Depletion Model (ASDM) (Schroeder, 1987). The rate and timing of stream depletion are dependent on the properties of the subject aquifer and the distance between the pumping well and the stream. In general, the greater the distance between the pumping well and the stream, the greater the time period is between pumping and stream flow impact. The aquifer characteristics and well properties described above were used to define the ASDM parameters. An average pumping rate of 90 gpm and a transmissivity of 30,000 gpd/ft were used to predict the rate and timing of stream depletion of the Entiat River. The model predicts that after one day of continuous pumping, stream depletion accounts for approximately 90 percent of the water drawn from the proposed wells. Similarly, when the pumping ceases, stream depletion is expected to decrease by more than 90 percent within one day. As a result, the proposed well is considered to be in direct hydraulic continuity with the Entiat River, and the proposed well can be effectively managed in the same manner as the historic POD.

Availability

Precipitation and snowmelt within the drainage basin provide water to maintain streamflow and groundwater levels. The Small well (BCA945) was successfully air-tested after construction at over

40 gpm for 1 hour. Based on its location and shallow depth, the inferred source aquifer is likely in hydraulic continuity with the adjacent Entiat River. It is unknown what the capacity of the installed pump is. Since the capacity to pump the 90 gpm from the well has not been demonstrated, it is unknown if water is physically available to meet the requested withdrawal of 90 gpm (0.4 cfs) and 43.86 af/yr. However, based on nearby wells, high aquifer transmissivities, the thickness of the aquifer, and the proximity of the river, it is likely that 90 gpm can be obtained at the site from a well (or wells). Note that the manufacturer's suggested capacity for the well screen is approximately 460 gpm.

There are no closures on surface water bodies in WRIA 46. Therefore, groundwater is legally available for appropriation.

Impairment

The requested change is for use from a well that is located 500 feet from the nearest well and will not impair existing users. The change from a direct surface water diversion to a groundwater withdrawal will buffer the impacts to the Entiat River and the water right will not be increased and therefore will not impair existing water rights.

Public Interest

RCW 90.03.290 requires that a proposed appropriation not be detrimental to the public interest. The seasonal withdrawal from March 1 through October 1 for irrigation is consistent with state policy without adversely impacting instream flows or other public needs and values. No detriment to public interest could be identified during the examination of the subject application.

In general, removing PODs and instream structures from a river has a positive impact on aquatic habitat. Diversions and instream pumps require frequent servicing that involves entering the river to repair structures, remove silt and debris from screens, and maintaining pushup dams. Replacing a POD with a POW alleviates the need for repeated construction in the river and the associated disturbances from increased silt loading and streambank modifications.

Consideration of Protests and Comments

No protests or comments have been filed.

CONCLUSIONS

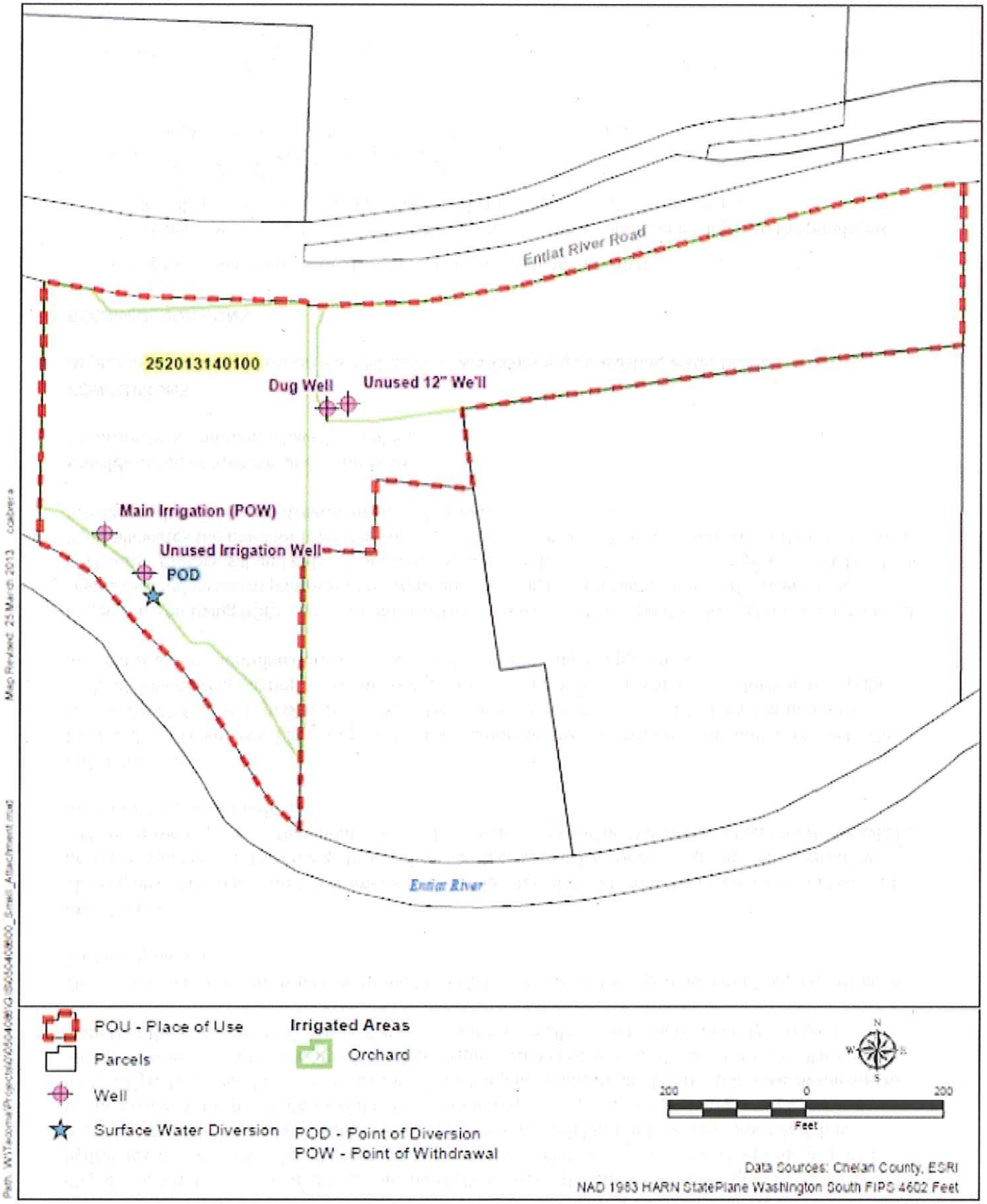
Approving Change Application No. CS4-24994C would not impair existing water users.

RECOMMENDATIONS

Based on the information presented above, the author recommends that:

> Change Application No. CS4-24994C be approved in the amounts, and subject to the provisions described in the Order for Report of Examination No. CS4-24994C, pages 1-3.

Report by: Joel W. Purdy _____
Joel W. Purdy, LG, LHG Date

Reviewed by: Kelsey J Collins _____ 3/13/14
Kelsey Collins Date

ATTACHMENT 1:Place of Use, Existing Point of Diversion, Proposed Point of Withdrawal and Irrigated Areas for the Small Change Application No. CS4-24994C