WATER TRANSFER WORKING GROUP PROJECT DESCRIPTION

APPLICATION NO./COURT CLAIM NO.		
CS4-84594-J		
APPLICANT NAME	CONTACT NAME	TELEPHONE NO.
Selah-Moxee Irrigation District (SMID)	Nathan Draper	(509) 469-0449
WATER RIGHT HOLDER'S NAME (if different)		EMAIL
SMID		smidistrict@qwestoffice.net

DATE OF APPLICATION	PRIORITY DATE
September 24, 2019	January 26, 1887

WATER SOURCE:	CROP:
Yakima River	N/A
INSTANTANEOUS QUANTITY:	ANNUAL QUANTITY:
38 cfs maximum (38 cfs: Apr 1 to Aug. 31; 29 cfs: September; and 22 cfs: October)	13,781.0 acre-feet/year (afy)
PERIOD OF USE:	
April 1st to October 31st	
PLACE OF USE:	PURPOSE OF USE:
Yakima and Columbia Rivers commencing at the existing point of diversion within SW¼NW¼ Sect. 7, T13N, R19E.W.M. and extending downstream in the Yakima River to its confluence with the Columbia River and within the Columbia River to the Pacific Ocean	Instream flow and mitigation.
IRRIGATION METHOD:	
Multiple Irrigation Methods (sprinkler, drip, etc.)	

CONSUMPTIVE USE CALCULATION:

Change application No. CS4-84594-J requests to change 38 cfs and 13,781 afy as authorized under S4-84594-J to instream flow and mitigation purposes and to transfer the right to the State's Trust Water Rights Program (Trust). The consumptive use portion of the total annual quantity of 13,781afy proposed for transfer to Trust is 9,709.1 afy. The remaining 4,071.9 afy is non-consumptive and includes saved conveyance water and on-farm return flow savings. The non-consumptive water is present in the primary reach only between approximately RM 116 (historic POD) and RM 107.5 (end of Hubbard canal).

The 9,709.1 afy of consumptive use quantity to be placed in trust represents consumptive savings from a series of changes within the District including fallowing land, cover crop savings derived from large scale changes in irrigation practices and piping reaches of District canal. The Table below summarizes the results of the consumptive use calculations:

		Area (acres)	CU Water Duty (ft/ac)	CU Water Savings (af)
A	1) Small Parcel	284.21	3.32	943.58
	2) Larger Parcels Nonirrigable	843.3	3.32	2,799.52
	3) New Roads*	34.9	3.32	115.86
	4) Larger Parcels Irrigable	645.9	3.32	2,144.39
	5) Actively irrigated	193.63	3.32	642.80
B	6) Hop Fields (flood to drip)	3578.78	0.85	3,048.30
C	7) Canal Evaporative Loss	2.4	2.91	6.98
	8) Canal Dependent Acreage	1.59	4.85	7.71
	TOTAL			**9,709.13**

Consumptive use calculations are grouped into 3 categories below: A) Fallowed/irrigated land; B) Hop fields flood to drip cover crop savings; and C) Canal piping and removal.

A) <u>CU for fallowed/irrigated acres:</u>

This represents 1,808.3 acres previously irrigated by the District that have been since removed from production (Lines 1-4) and 193.6 acres that are still irrigated but will be irrigated in the future under a new mitigated application (line 5). Consumptive use calculations for all 5 categories are based on the Washington Irrigation Guide (WIG) and Ecology Guidance 1210 with the following assumptions:

- WIG crop irrigation requirement (CIR) for pasture/turf at Moxee City station of 35.15 inches (2.93 feet) as indicator crop across multiple crops in SMID services area.
- Average application efficiency (Ea) of 75% and percent consumptive use of 85% for impact sprinklers in Ecology Guidance 1210 (Table 1)
- Per Guidance 1210, Total Irrigation requirement (TIR) is TIR= CIR/Ea, so on a per acre basis TIR = 2.93ft/0.75 = 3.91 acre-ft/acre
- Consumptive Use (CU) is CU=TIR x %CU, so on a per acre basis, CU = 3.91 x 0.85 = 3.32 acre-ft/acre. The remaining 0.59 ac-ft/ac (3.91ft-3.32ft= 0.59ft) represents the non-consumptive use per acre on-farm.

1) <u>Small Parcels</u>. The small parcels include former irrigated crop land that was subdivided and replaced with houses, impervious areas, and lawn and garden irrigated area. Conducting a GIS analysis for a representative number of parcels across the district, the total area of converted crop land to impervious area or structures was determined to be 45.4% of each parcel on average. Applying the representative 45.4% impermeable surface to the total area of new domestic parcels (less than 1 acre in size and subdivided from irrigated crop land since the CFO) yields 284.21 acres of fallowed land.

   Applying the 3.32 ac-ft per acre of consumptive use to 284.21 acres results in a total consumptive use savings of 943.58 afy for small parcels.

2) <u>Larger Parcels Non-irrigable</u>. A total of 843.3 acres of irrigated crop land has been removed since the CFO and replaced with building infrastructure. This includes new businesses and structures (for example, Ace Hardware, parking lots and commercial storage units). The irrigated acreage that was replaced by impermeable surface was measured individually on a per parcel basis in GIS using air photos, and was determined to be 843.3acres.

   Applying the 3.32 ac-ft per acre of consumptive use to the 843.3 acres results in

a total consumptive use savings of 2799.52 afy for larger parcels non-irrigable.

3) Roads. A total of 34.9 acres of irrigated crop land has been removed and replaced with paved roads. This includes new large roads (such as Duffield Rd) and streets in new subdivisions. The paved area was measured in GIS.

   Applying the 3.32 ac-ft per acre of consumptive use to the 34.9 acres results in a total consumptive use savings of 115.86 afy for roads.

4) Larger Parcels Irrigable. A total of 645.9 acres of irrigated crop land has been removed and fallowed. This area is listed as irrigable because it could be used for crop production in the future, but has been fallowed to date. The fallowed area was measured in GIS for each parcel and totals 645.9 acres.

   Applying the 3.32 ac-ft per acre of consumptive use to the 645.9 acres results in a total consumptive use savings of 2,144.39 afy for larger parcels irrigable.

5) Actively irrigated. The above fallowed area described in lines 1-4 above totals 1,808.3 acres. Of the total 2,001.94 acres authorized under S4-85494-J, the remaining 193.63 acres represents a portion of land still irrigated within the District boundary. These acres are proposed for continued irrigation but under the new application No. S4-33241 mitigated by this senior right.

   Applying the 3.32 ac-ft per acre of consumptive use to the 193.63 acres results in a total consumptive use of 642.80 afy for active irrigation.

B) Hop fields flood to drip cover crop savings

The hops savings in the table above represents irrigation practice changes from historical flood irrigation to present-day drip irrigation on 3,578.78 acres of hops fields. The consumptive use savings is due to the change in area of irrigated cover crop with flood irrigation practices to drip irrigation and hop spacing. All hops fields in the district are currently irrigated using drip irrigation practices. Based on multiple line of evidence approach (farmer interviews for 63% of the District's hop area, air photo analysis, field measurements, periodic field observations over the course of the 2019 irrigation season for the select rows), it was determined that an average of 12% of the cover crop benefits from the current drip irrigation as compared to 100% of the cover crop when the hops fields were irrigated with flood irrigation.

The WIG for the Moxee City station lists a CIR for hops of 27.88 inches or 2.32 ft. The average duty for cover crop for the Moxee City station was calculated to be 10.17 inches or 0.847 ft. This was based on comparing CIR for orchards with cover to orchards without cover in the WIG (average of apples, apricots, cherry, peach, and pear and plum) and averaging the differences to determine an average cover crop requirement of 0.847 ft for the Moxee area.

The consumptive use saving calculations are presented below:

- **Moxee WIG: Hops CIR_H = 2.32 ft and Avg cover CIR_C = 0.847 ft***
- **Rill irrigated hops historically**
  - 100% cover crop uses water, CIR_c = 0.847 ft
  - Total CIR = CIR_h + CIR_c = 2.32 + 0.847 = 3.17 ft
  - Graded furrow: Ea of 65% and CU of 70% (GUID 1210)
- **Drip irrigated hops currently**
  - 12% cover crop uses water; CIR_c = 0.847 ft x 0.12 = 0.10 ft
  - Total CIR = CIR_h + CIR_c = 2.32 ft + 0.10 ft = 2.42 ft
  - Trickle/drip: Ea of 88% and CU of 93% (GUID 1210)
- **TIR = CIR/Ea and CU = TIR * %CU**

Category	Area (acre)	Total CIR (ft)	%Ea	TIR (ft)	Total use (afy)	%CU	CU (afy)
Historical Rill	3,578.8	3.17	65%	4.88	17,457	70%	12,220.0
Current Drip	3,578. 8	2.43	88%	2.76	9,862	93%	9,171.7
						Difference	**3,048.3**

The 3,048.3 afy of savings represents 0.85 ac-ft per acre on the total 3,578.78 acres of hops.

C) <u>CU savings from canal piping and removal (lines 7 and 8):</u>

Since the CFO, a total of 3,583 feet (0.68 miles) of the District's canal have been decommissioned and an additional 17,331 feet (3.28 miles) have been piped. Field surveys of existing canals were conducted to evaluate extent of dependent vegetation and canal evaporation. Results of the survey were used to estimate savings for the segments that have already been abandoned or piped.

7) <u>Evaporative CU savings:</u>

A consumptive use savings of 2.91 ac-ft/ac was used for canal surface evaporation. The value was based on pan evaporation data for the project area from the Western Regional Climate Center (WRCC), which provides average monthly values at Yakima for the period between 1946 and 2005. Pan evaporation between mid-March and mid-October, when the SMID canals are filled, averages 47.21 inches (3.93 ft). To estimate evaporation from a free surface (i.e., the surface of a canal), a pan coefficient of 0.74 was used for the Project area, based on the National Oceanic and Atmospheric Administration (NOAA) *Map of Coefficients to Convert Class A Pan Evaporation to Free Water Surface Evaporation* (NOAA, 1982).

Typical width of the water surface for the District's canals is 5 feet based on field surveys. Applying this width to the total length of canal abandoned (0.68 miles) plus canal piped (3.28 miles) results in an area of 2.4 acres. Evaporation (in acre-feet) is determined by multiplying surface area (in acres) by the average pan evaporation (in feet) by the pan coefficient, or Total Evaporation during the irrigation is = 3.93 ft x 2.4 acres x 0.74 = 6.98 afy.

8) <u>Dependent Vegetation CU savings:</u>

A crop irrigation requirement of 4.85 ac-ft/ac was determined to be a reasonable estimate of consumptive use per acre of riparian vegetation based on information collected during field surveys, a crop coefficient (Kc) of 1.08 assumed based on literature values and similar studies, and 2015 Reference Evapotranspiration rates from USBR AgriMet Station in Harrah, WA totaling 53.97 inches for the mid-March to mid-October period when the canals are operating.

Typical extent of canal dependent vegetation on either side of the canal was found to be 2 ft on each side (total of 4ft) based on field surveys based on reasonable care and maintenance. Applying this 4 ft width to the total length of piped canal (3.28 miles), results in an area of 1.59 acres. Applying the crop irrigation requirement per acre of 4.85 ac-ft/ac for canal vegetation, this results in 7.71 afy of consumptive use savings from former canal dependent vegetation. (1.59 acres x 4.85 ac-ft/ac = 7.71 afy)

As a result, total consumptive use savings for piped and abandoned District canals is 14.1afy.

Summing consumptive use totals under the above categories A-C above results in a total consumptive use of 9,709.1 afy.

NARRATIVE DESCRIPTION OF PROJECT:

Selah Moxee Irrigation District has been planning upgrades and conservation measures for their water delivery infrastructure including piping canals and lining their tunnel through the Yakima Ridge. At the same time, they are reviewing their water rights portfolio to quantify the consumptive use portion of water use savings due to recent changes in urbanization and irrigation practices. Following a flood in 1996 that washed out their main Moxee-Hubbard diversion and subsequent temporary changes through the Yakima Court as part of the Acquavella Adjudication in 2000, 2005 and 2006, the District is now requesting permanent changes to their Moxee-Hubbard water rights to add existing surface diversions that would allow operational flexibility and reflect the District's current practices on a permanent basis.

The three water right applications include:

1) Application to permanently transfer the District's senior Moxee/Hubbard water right No. S4-84594-J into Trust Water Rights Program for instream flow and mitigation (38 cfs and 13,781 afy with a priority of 1/26/1887);
2) Application for a new mitigated water right No. S4-33241 for 11.41 cfs and 3,278.8 afy for irrigation of 839.5 acres within the District's service area from the existing diversions at Pomona, Roza Wasteway pump station and Fowler Ditch; and
3) Application to change the points of diversion of the District's junior Warren Act Right No. S4-84595-J to the same Pomona, Roza Wasteway and Fowler Ditch diversions.

The balance of the senior right No. S4-84594-J not used to mitigate for Application No. S4-33241 will be retained in trust to be used as mitigation for the District's wholesale water banking efforts to help fund the District's infrastructure upgrades and for possible District water use in the future.

The three applications will not impact Total Water Supply Available at Parker. There will also be no increase in consumptive water use as a result of the two changes and the new mitigated application. To help ensure this, the District commits to conducting periodic audits of its consumptive use with reports to Ecology to be included as provisions on the rights. The audit will include an accounting of irrigated acreage and crop type.

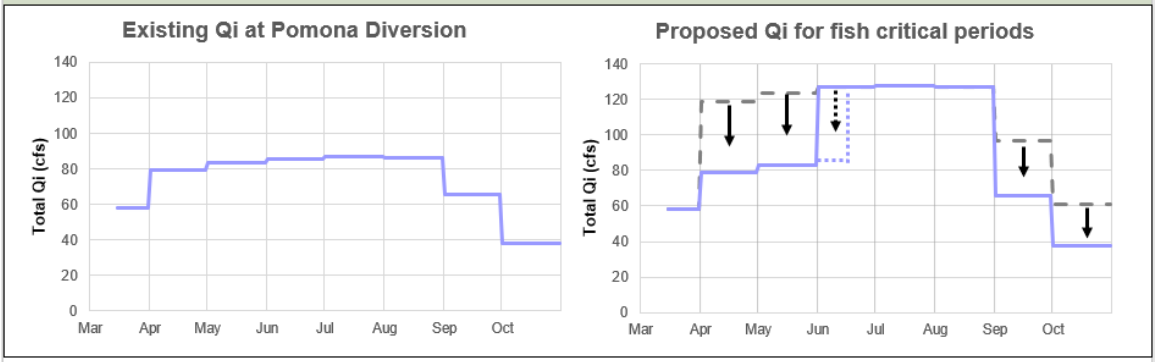
The changes in points of diversion include retaining the diversion from the Roza Tailrace located behind the Bureau's Yakima Field Office in Section 17, T13N, R19EWM; adding the Fowler Ditch Diversion downstream of the original Moxee /Hubbard Diversion

(washed out in 1996 flood) within Section 7, T13N, R19EWM; and adding the existing Pomona Diversion (SE¼ of Section 8, T14N, R19EWM) which is the authorized diversion for the District's four other water rights (S4-84590-J, S4-84591-J, S4-84592-J and S4-84593-J).

The request to permanently add the Pomona Diversion is similar to temporary changes through the Court in 2005 and 2006 and represents an upstream transfer from the former Moxee/Hubbard Diversion located just downstream of the confluence with the Naches River to the District's existing Pomona Diversion downstream of the Roza ID diversion. The District proposes to address local impacts to the intervening reach below Pomona by limiting total diversions at Pomona to the Qi currently authorized under existing rights (S4-84590-J, S4-84591-J, S4-84592-J and S4-84593-J) during fish-critical periods. The graphs below summarize the District's proposal to limit diversions during flip-flop; during early season out-migration time periods from April 1st to May 31st; and from June 1st to 15th only at times when flows at RBDW fall below 1300 cfs.

Limitation on Pomona Diversions (Qi)

- No increase in Pomona diversions during fish-critical periods
- SMID commits 300 afy CU instream in the Trust Program over Parker



Example Provision:

"Instantaneous diversions for this permit at the Pomona diversion shall not exceed the historic authorized quantities for S4-84590J, S4-84591J, S4-84592J, and S4-84593J during the following periods:

- **April 1st to May 31st;**
- **June 1st to June 15, during periods when flows as measured at RBDW fall below 1300cfs;**
- **September 1st to October 31st**

From June 15th to August 31st, the instantaneous quantity in this permit is additive to the quantities authorized for S4-84590J, S4-84591J, and S4-84593J."

earth+water

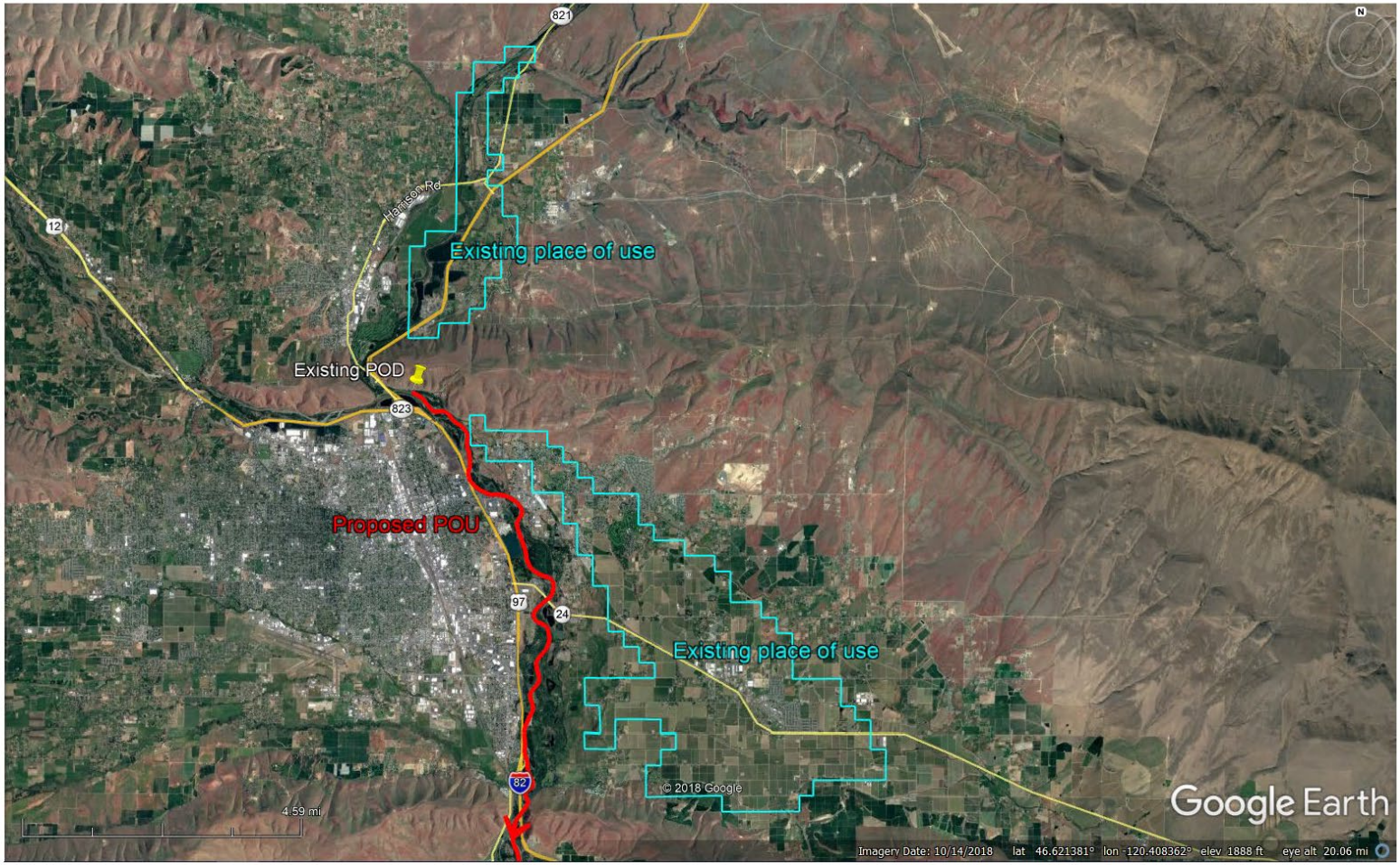


Figure 1
Change Application Map for S4-84594-J
Selah-Moxee Irrigation District
Yakima County, WA

Aspect Consulting
09/05/2019
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WTWG Project form