MISSION CREEK WATER QUALITY RESTORATION PHASE I

Mission Creek Water Banking Appraisal

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CHELAN COUNTY
Natural Resources
Department

Aspect CONSULTING

WATER BANKING APPRAISAL

Mission Creek Flow Improvement Appraisal
Alternative 1

Prepared for: Chelan County Natural Resources Department

Project No. 120045 • July 6, 2018

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1 Water Banking

Water banking may offer options to extend the reserve for permit-exempt uses in the Mission Basin and provide some limited stream-flow improvement. The water bank acts as an intermediary, bringing together buyers and sellers of water rights with predictability on the validity of the water right, the geographic area where it can be used, and for what purposes (e.g., domestic, commercial). The overall goal of a water bank is to facilitate water transfers using market forces. In Washington State, the legislature has identified additional objectives of water banking in the Revised Code of Washington (RCW) 90.42.100, which include:

- Making water supplies available when and where needed during times of drought.
- Improving stream flows and preserving instream values during fish-critical periods.
- Reducing water transaction costs, time, and risk to the purchaser.
- Facilitating fair and efficient reallocation of water from one beneficial use to another.
- Providing water supplies to offset impacts related to future development and the issues of new water rights.
- Facilitating water agreements that protect upstream community values while retaining flexibility to meet critical downstream water needs in times of scarcity.

Some of the analysis for this alternative was adapted from similar water-banking efforts Aspect Consulting, LLC (Aspect) has led or co-led in such locations as Kittitas County and Spokane County for the 2016 Water Supply and Demand Forecast, and for private water banks, and modified for applicability to Mission Creek. Specific bank operation and administration decisions will need to be made by Chelan County Natural Resources Department (CCNRD) as described in greater detail herein.

1.1 Water Banking Defined

The traditional definition for water banking is an institutional mechanism used to facilitate the legal transfer and market exchange of water (Clifford et al., 2004). However, the term “water banking” is used to refer to a variety of water management practices that extend beyond the traditional definition. Although water-banking definitions and approaches differ, the common goal is to move water to where it is needed most.

Water banking is facilitated by an institution (the water bank) that operates as a broker, clearinghouse, or market maker. This can be a County, City, Irrigation District, Washington State Department of Ecology (Ecology), a nonprofit entity, a private corporation, or others. A clearinghouse serves mainly as a repository for bid and offer information (e.g., a website where buyers and sellers can post opportunities). Brokers connect or solicit buyers and sellers to create sales (e.g., water attorneys), and a market maker attempts to identify buyers and price water to sell (e.g., a farmer who is retiring or Ecology developing water from storage).

Many banks pool water supplies from willing sellers and make them available as credits to willing buyers. Generally, a water bank sets the rules of water bank operations, determines which rights can be banked, certifies water quantities entering and leaving banks, sets terms and prices, and facilitates the regulatory requirements (Figure 1). In Washington, many of these actions are defined in the Trust Water Right Agreement (TWRA) between the water bank and Ecology. These business functions include determining which rights can be banked, certifying water quantities entering and leaving banks, and setting some of the rules of water bank operation, such as quantities and locations of water banking.

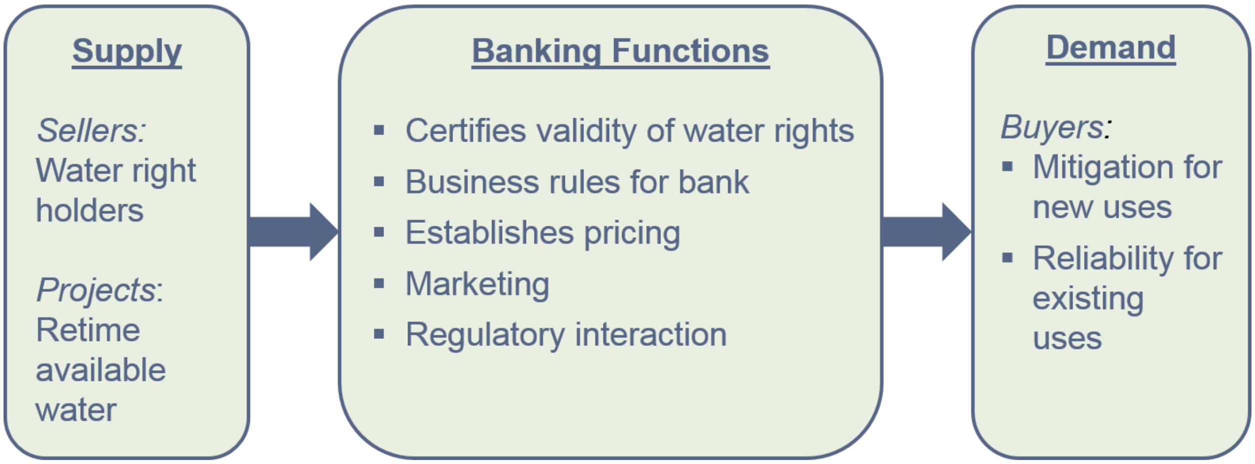

Figure 1. Water Banking Overview

1.2 Water Banking Authority

States authorize banking in a variety of ways. Authorization ranges from explicit water banking legislative action with oversight provided by state agencies, to implied water banking policies and legislation that facilitates transfers, to watershed-level actions, to the use of federal policies to support activities. In Washington, water banking has been authorized by the legislature through House Bill 1640 (2003) and the amendment of RCW Chapter 90.42, with Ecology providing regulatory oversight. In the Mission Basin, no additional regulatory authority is necessary to create a water bank. For water banking in Chelan County, CCNRD can rely on the existing statutory framework provided in RCW 90.42.

1.3 Water Bank Functions

Water bankers provide various services to meet instream and out-of-stream water demands. Each trust water right agreement and the driving water management goal along with who the water bank serves will dictate the type of water bank model used and for what purposes. There are four structural/ownership models of water banking that have emerged in Washington. These different structures are generally based on funding type, bank administration, and bank purpose:

1) Public (e.g., Kittitas County Water Bank, City of White Salmon Water Bank)
2) Quasi-Government (e.g., Dungeness Water Bank, which is a county/nonprofit partnership)
3) Nongovernmental Organizations (NGO) (e.g., banks managed by Washington Water Trust)
4) Private (e.g., Upper Kittitas water banks, which operates for profit)

In the Mission Basin, a water bank operated by CCNRD that builds on the existing reserve framework would be the most straightforward to implement.

1.4 Water Bank Models and Metrics

Water banks participate in water transactions for a variety of purposes and over varying water quantities, from residential groundwater-use mitigation of less than 1 acre-foot,[1] to permitted water rights leases and sales for thousands of acre-feet. There are also differences in the amount of consumptive and nonconsumptive water transacted from water banks, based on purpose and types of water use. To compare different banks and model types, it is important to consider consistent units and specific metrics (e.g., cost per unit, and units transacted). For the purposes of this report, a unit of mitigation is the quantity of water a water bank does business in.

The most important emerging metric for water banking is basing transfers on consumptive use rather than total use. This is the case in the Mission Basin, where reserve accounting is tracked based on September consumptive-use equivalents that correlate to the 1 to 2 percent habitat loss during the low-flow month, on which the reserve was predicated.

Consumptive use is defined in several Ecology laws, rules, and policies in varying ways, including:

- “Water that is transpired by plants at the place of use, water that escapes from a reasonably efficient conveyance system or from the place of use but does not become return flows and water that is contained within a product or within a production byproduct” (Ecology, POL1210).
- “Consumptive use includes crop evapotranspiration, and water evaporated during irrigation applications (e.g., spray, canopy and wind losses)” (Ecology, 2018).
- “Consumptive use means use of water whereby there is a diminishment of the water source” (Washington Administrative Code [WAC] 173-500-050(5)).
- "Annual consumptive quantity’ means the estimated or actual annual amount of water diverted pursuant to the water right, reduced by the estimated annual amount of return flows, averaged over the two years of greatest use within the most recent five-year period of continuous beneficial use of the water right” (RCW 90.03.380).

Consumptive use has emerged as a common water bank metric because in many over-appropriated or seasonally limited basins in Washington, downstream junior appropriators rely on return flows as part of their water supply availability. In such situations, any increase in consumptive use would result in actual or presumptive impairment of third parties. Detailed calculations of consumptive use are becoming a standard in the water-banking industry, often requiring engineers, hydrogeologists, or other scientific professionals to interpret historical beneficial use using aerial photographs coupled with scientific literature and real-time data (e.g., Washington Irrigation Guide, AgriMet, AgWeatherNet, and others). Figure 2 is a conceptual representation of the consumptive water budget.

[1] An acre-foot is a unit of volume equal to the amount of water required to cover on acre of land with a foot of water. There are 325,851 gallons in 1 acre-foot.

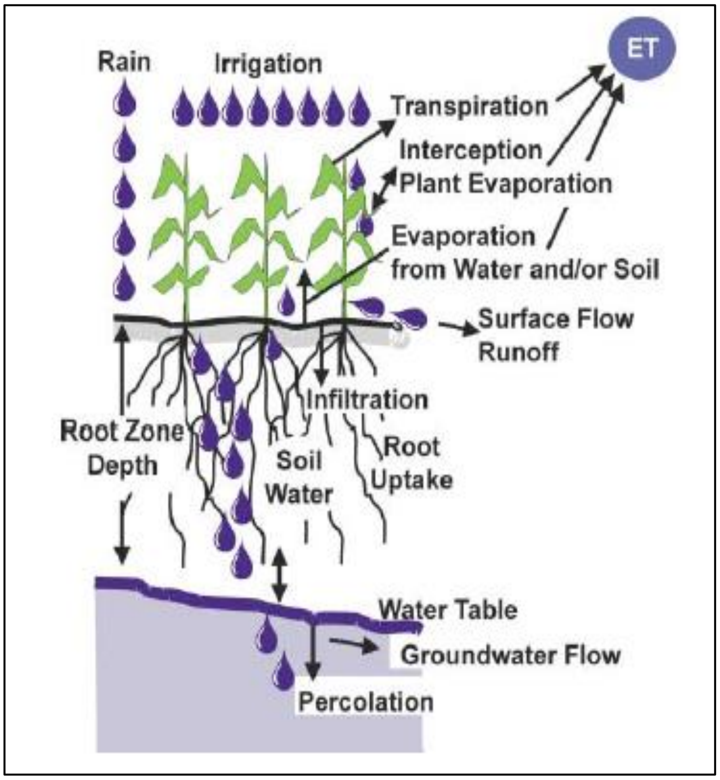

Figure 2. Components of Consumptive Use[2]

Consumptive-use metrics are also used in water banking for nonagricultural purposes, including domestic use, stock-water use, and commercial and industrial uses. For example, Ecology adopted the Upper Kittitas Rule, WAC 173-539A, which describes how domestic consumptive uses will be allocated in the context of water banks operating in the rule area:

> *Consumptive use will be calculated using the following assumptions: Thirty percent of domestic in-house use on a septic system is consumptively used; ninety percent of outdoor use is consumptively used; twenty percent of domestic in-house use treated through a wastewater treatment plant which discharges to surface water is consumptively used (WAC 173-539A-050(3)).*

Although not explicitly stated in WAC 173-545-090, consumptive use is the metric by which the current Mission Basin reserve is administered, based on the rule adoption framework that was related to habitat loss (which occurs by increased consumptive use in a basin). A future water bank in the Mission Basin would likely build on this consumptive-use framework.

1.5 Water Banking Seeding Mechanisms

There are two primary concepts of water availability that drive water banking and seeding mechanisms: physical availability and legal availability. Some water banks make water physically available from their supply for withdrawal/diversion. Other water banks simply address legal availability, so a new diversion/withdrawal will not impair another user.

[2] Irrigation Efficiency, Encyclopedia of Water Science (Howell, 2003)

An example of a water bank that supplies physical water is the Lake Roosevelt Incremental Storage Release Project. For this bank, water is made physically available for use by storing and releasing water from Lake Roosevelt (Figure 3). Individual users who desire water from this bank must enter into a water service contract with Ecology's Office of Columbia River, along with a permit to use water. All the users from this bank physically access some of the water that is released, although there is some flexibility on the timing of releases relative to the timing of diversions, which are intended to maximize fish benefit in the Columbia River.

Examples of banks trying to solve legal availability issues are the Yakima Basin water banks. In the Yakima Basin, the Bureau of Reclamation withdrew all unappropriated water on May 10, 1905, for the development of several irrigation projects. Because of this, any new use in the Yakima Basin must be neutral with respect to the Yakima Basin's total water supply available (TWSA) at a gaging station on the Yakima River known as Parker (labeled PARW on Figure 4). This TWSA neutrality prevents impairment of the Bureau of Reclamation right or other senior water rights in the basin. To meet this requirement, water rights have been placed into the Trust Water Rights Program (TWRP) to offset new uses and ensure TWSA is not impacted at Parker. However, the new uses are not necessarily coupled to the banked water in a way that ensures physical access to the water in the bank. In this example, it can be possible to mitigate for impacts to other water users, address legal availability of water, and not physically divert any of the banked water. The management of the Yakima Basin is illustrated on Figure 4.

In the Mission Basin, water for new permit-exempt uses would likely be incorporated into the current reserve framework, based on September consumptive-use equivalents. Traditional bank seeding would be from a retired irrigation right (or portion thereof). The consumptive use associated with that right would be enrolled into the water bank, and an estimate of the number of houses that could be added, based on consumptive use available in September to be debited, would be calculated.

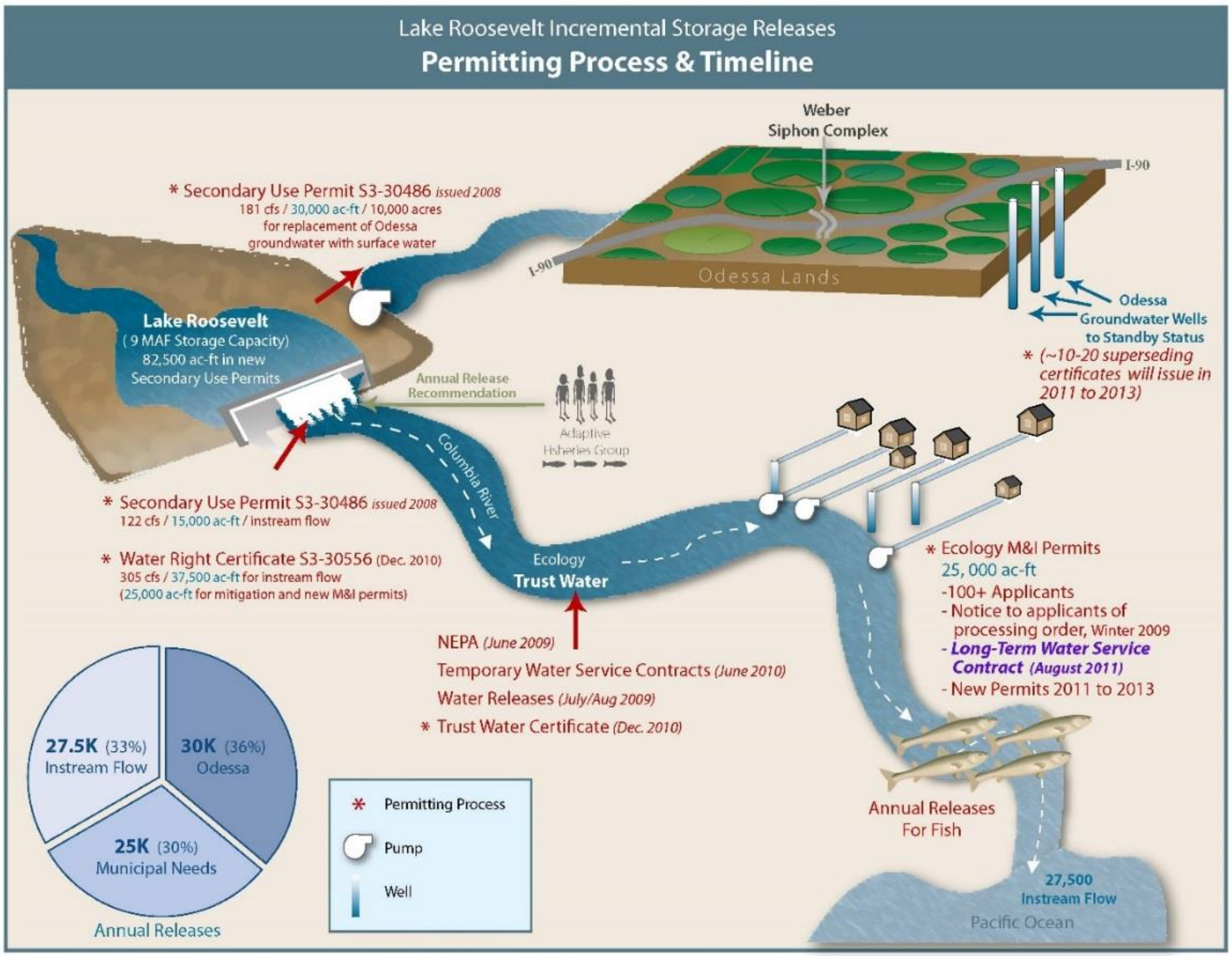

Figure 3. Example of Physical Availability

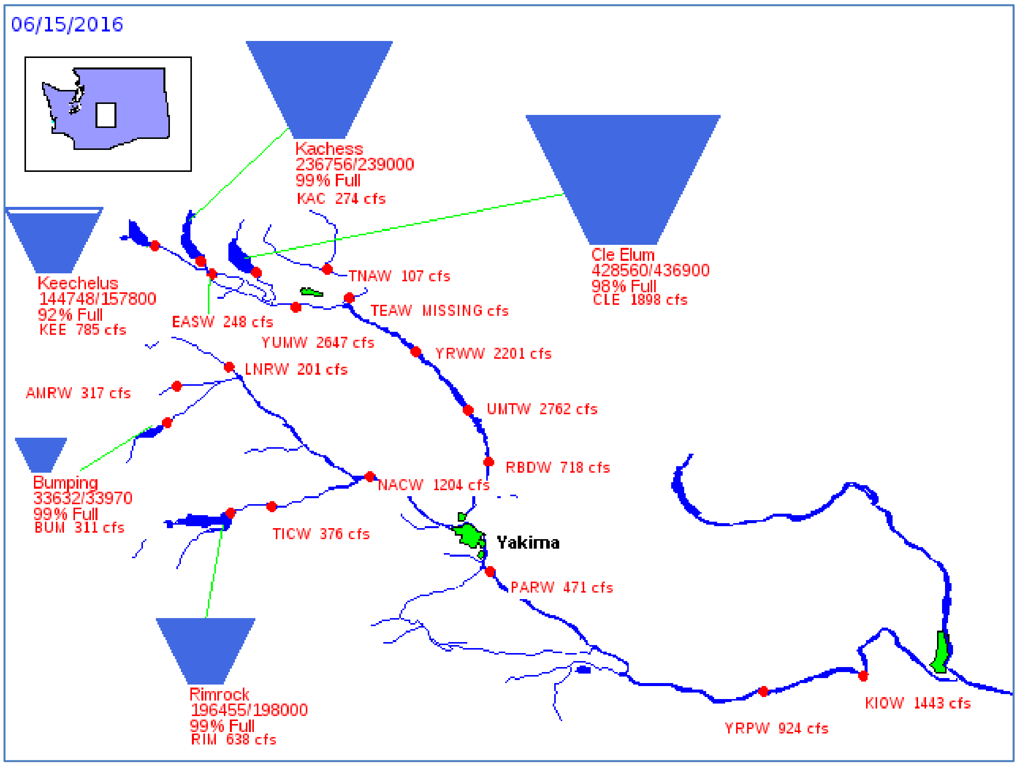

Figure 4. Water Supply Model for Yakima Basin

1.6 Washington State Market Activity and Participation

This section discusses Washington's water allocation framework, water banking policy, water banking programs, and compares the water banking models and compares their effectiveness in solving current and anticipated water problems.

1.6.1 Washington Water Allocation Framework

Washington, like other western states, has a prior appropriation framework for water allocation. In times of limited water availability, those who put water to beneficial use first (senior priority dates), have the right to the full use of the water before subsequent users (junior priority dates)—in other words, "first in time, first in right." In dry years, this allocation framework creates a system of "haves" and "have-nots." Those with earlier priority dates enjoy the right to use the full extent of their water right, while those with later priority dates often cannot. Water banking provides a market-based approach to solve this problem by allowing senior water to be reallocated for new uses.

An illustration of how the prior appropriation system works in Washington is described below for the Mission Subbasin (Figure 5). Senior water right holders that predate the adoption of the original 1983 Instream Resources Protection Program (IRPP) always receive a full allocation of water irrespective of the type of water year. The next most senior right in the base is the instream flow rule, adopted in 1983 and updated in 2006. The 1983 flows, which were updated in 2006, are met completely in some years (e.g., wet years) and incompletely in other years (e.g., average/dry years). In 2006, following consensus-based watershed planning, the 4 cubic feet per second (cfs) Wenatchee Reserve (including Mission Subbasin) was adopted, which created a "firm" or "noninterruptible" reservation of water with the same priority date that was confirmed by the Legislature in SB6513. Finally, there are 56 junior water users in the Wenatchee basin who are interrupted whenever weekly instream flows are not met, 7 of which are interrupted specifically by Mission Creek flow targets in WAC 173-545-050.

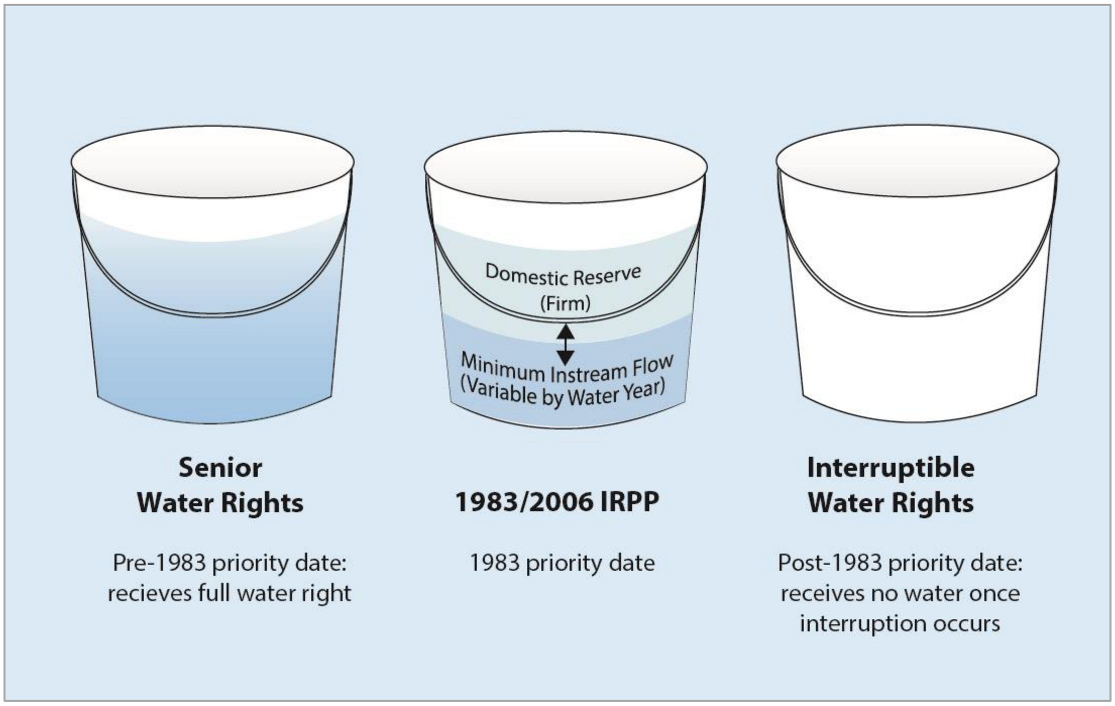

Figure 5. Prior Appropriation System in Mission Creek

1.6.2 Washington Water Banking Statutory Review

1.6.2.1 Water Banking Authority

Washington's statute governing water banking is authorized in RCW 90.42.[3] While the concept and use of the term water bank has been around for years, comprehensive state-wide water banking legislation was not passed by the Legislature until 2009.[4] A trust water right is any water right acquired by the state for management in the TWRP on a temporary and/or permanent basis. The TWRP provides a way to legally hold water rights for future uses without concern for the relinquishment for nonuse per RCW 90.14.140(2)(h). Water rights are typically held in trust to benefit instream flows or preserve groundwater, to protect them from relinquishment, to be considered beneficially used, or to offset new out-of-stream uses.

While in the TWRP, the water right maintains its original priority date, with a specified place of use (stream reach or aquifer), an instantaneous and annual quantity (typically specified as a monthly schedule), and a period of use (e.g., irrigation season, or year-round). These instream-flow water-right attributes are necessary for the trust water right to be beneficially used and account for the water right as instream flow to offset (mitigate) new water uses. Ecology's use of a water right it holds in

[3] A Yakima Basin trust water statute also exists in RCW 90.38; however, it focuses strictly on the trust water right statute applicable to that County and is not applicable in the Mission Basin.
[4] See in general RCW 90.42.100 through 130.

trust is typically governed by a TWRA, which is a contract between the state and the owner of the water right describing the terms of trust.

Trust water rights are considered beneficially used when they are exercised for incremental enhancement of instream flow. Ecology can provide notice of exercise of trust rights through a public notification process via the internet.[5]

Ecology has a statutory role in setting up water banks via the TWRP, though day-to-day administration of the banks range from full Ecology administration (e.g., Port of Walla Walla, Lake Roosevelt, Sullivan Lake, Cabin Owners) to third-party administration (e.g., Dungeness, Walla Walla). Potential water-bank managers need to reliably fill this function in a way that meets the public trust standard. Managers currently include local government, such as counties or cities, creation of a watershed-based water resource management entity, nonprofit NGO's, or private companies or individuals. The TWRP provides the fundamental authority for water banking. The source water right that is "banked" is held by Ecology in the TWRP. To use the water for out-of-stream mitigation, or issue mitigation credits from the bank, the TWRA specifies many of the rules such as location, quantities that can be used for mitigation, and the quantity of the mitigation credit. The water is held in the TWRP until its diversion authority is formally conveyed to the buyer. Ecology policy requires the use of the TWRP to ensure water availability at the new location, because it is a mechanism to protect water from other intervening users. Typically, this involves four procedural steps in the example of a potential Mission Creek water right acquisition related to fallowing a small irrigation parcel:

1) Attributes of a senior water right are changed, either by Ecology or a local conservancy board, including:

    a. The purpose of use, typically changed to instream flow and mitigation of new out-of-stream uses.

    b. The place of use changed from the former appurtenant land to the portion of river or aquifer where the bank will operate.

    c. The point of diversion is eliminated and replaced with a description of the "primary" and "secondary" reaches of the trust water right. The "primary" reach is quantified based on total use from the historical point of diversion to the historical return flow point. The "secondary" reach is quantified as the consumptive portion of the right below the historical return flow point (Figure 6).

    d. Extent and validity of the water right is analyzed.

[5] http://www.ecy.wa.gov/programs/wr/market/trstdocs. html

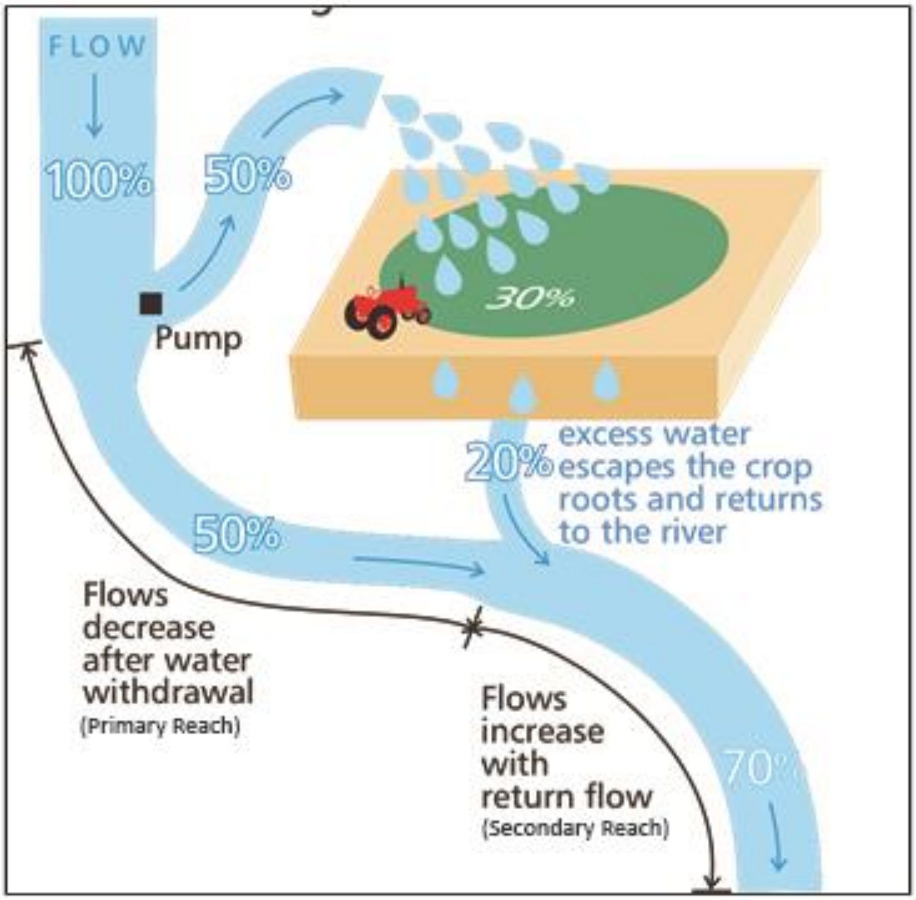

Figure 6. Primary/Secondary Reach Example

5) Water is conveyed to trust by a contract or deed. Ecology must have ownership interest in the water right seeding the bank in order for it to reside in the trust program for water banking purposes.

6) A TWRA is adopted. The TWRA is a contract that describes the conditions under which Ecology will hold the water right in trust and release and/or permit water from the water bank, explaining the purposes, metrics, and the water-right processing framework.

   New mitigated water rights are issued by Ecology and debited from the water bank. Chelan County would be authorized to issue mitigation certificates for permit-exempt uses and Ecology would issue Reports of Examination (ROE) and permits for all other uses. Accounting ensures that new "withdrawals" do not exceed the original "deposit."

Although Washington's TWRP was authorized in 1991, water banks have only significantly expanded in the last 10 years in response to several factors, including:

- River basin closures (i.e., basins closed to new water uses, such as in Upper Kittitas County, or diminished initial reserves as in the Mission Basin).
- Adoption of new instream flows rules (e.g., Dungeness water exchange).

- Response to local collaboration to solve water supply problems (e.g., Walla Walla, White Salmon, Little Spokane and Methow Valley banks).
- Through new legislative focuses (e.g., Office of Columbia River (OCR), Cabin Owner bank).

1.6.2.2 Water Banking Case Law

Case law on water-rights issues has been evolving based on several relevant recent decisions and will continue to affect water rights decisions in the state, given that several more key decisions are pending. Below is a summary of significant legal cases that impact water-bank development.

- ***Postema v. Pollution Control Hearings Board*** (Supreme Court of the State of Washington, 2000). This decision defined the "one molecule" standard for instream flow impairment, meaning impairment does not need to be physically measurable. Deminimus impacts can constitute impairment via demonstration using scientifically acceptable methods.
- ***Swinomish Indian Tribal Community v. Ecology*** (Supreme Court of the State of Washington, 2013). This decision invalidated reservations-established in rule for new water uses, including exempt wells, created through amendments to the Skagit instream flow rule. It also determined that Ecology went beyond its statutory authority in applying overriding consideration of the public interest (OCPI) to rulemaking that conflicted with the established instream flows. SB6513 was passed in 2016 in response to the uncertainty that the Swinomish decision caused on the Wenatchee Reserve, which was adopted in somewhat parallel circumstances.
- ***Foster v. Ecology*** (Supreme Court of the State of Washington 2015). In this decision, the Washington Supreme Court (Court) reversed Ecology's approval of the City of Yelm permit. The approval of this permit was based on the use of OCPI and an out-of-kind mitigation package. Ecology uses OCPI as a tool to approve water-right permits when water availability is limited, but it believes the public benefits of approval outweigh any impacts on stream flows. This decision implies a fundamental change on how water-short basins can access water. The implication of this ruling is that no permanent water right will be able to rely on anything other than water-for-water mitigation, in time and in place, and no amount of out-of-kind or out-of-time mitigation can offset even *de minimis* (one molecule) impacts to adopted instream flows. This ruling makes it imperative that banks appropriately match supply and demand spatially and temporally.
- ***Whatcom County v. Hirst*** (Supreme Court of the State of Washington, 2016). In this decision, the Court reversed a lower court decision that directed local governments to follow Ecology's interpretation of instream flow rules in determining water availability. This Court decision rescinds that direction, noting that the Growth Management Act (GMA) places an independent responsibility to ensure water availability on counties, not on Ecology. The decision also noted that the fact that county provisions are wholly consistent with Ecology's regulations does not, by itself, render them consistent with GMA requirements. In addition, this ruling imposes a strict standard for county review of cumulative impairment from exempt wells due to rural development.

Case law on exempt use, impairment of instream flows, conjunctive management of surface and groundwater, county building permit and Growth Management Act (GMA) responsibilities, and OCPI standards continue to be clarified by the court system. There is a corresponding trend towards county co-management with Ecology of the risk of future curtailment and the associated impacts on property values, on the ability to develop property, and on property transactions when instream flows are not met.

Ecology and counties are exploring ways to comanage risk based on the direction being provided by the courts, such as the evaluation of water-bank feasibility for particular basins. In addition, Ecology recently prepared a guidance document on the subject (*Finding Rural Domestic Water Solutions While Protecting Instream Resources*; Ecology, 2016a). The 2016 Legislature is considering numerous bills in the wake of the Hirst decision that may have implications on how exempt wells in the Mission Subbain are managed.

1.7 Incentives for Water Bank Participation

There are a number of reasons why existing and future water users in the Mission Basin would potentially participate in a water bank. The incentives are related to a number of factors, some of which are still in flux given potential Legislative actions. Incentives for participation include:

- **Mitigation source for new exempt wells.** With the reserve in WAC 173-545-090 for the Mission Basin depleted, a water bank could allow continued exempt uses to occur.
- **Interruptibility of new water right permits.** The adoption of the instream flow in Mission Creek means that the only new water rights issued in Mission Creek would be interruptible due to low-flow conditions during most summer weeks of the year. A water bank could provide a mitigated source of water for new permits.
- **Existing interruptibles.** There are seven existing interruptible water-right holders that might seek greater reliability of water use depending on crop choices. A water bank could offer options to transition to noninterruptible uses.

1.8 Water Bank Activity and Prices

There are numerous water banks operating in Washington State (Figure 7), with more being created each year. Selection of the type of water-banking model is dependent on the regulatory environment, timing of the need for water-bank development relative to regulatory actions, and ability of Ecology and counties to agree on the standards for the legal and physical availability of water.

Price, or the amount of money paid for one unit (not including fees), and volume of units transacted is highly variable between water-banking models, as shown in Table 1 (Ecology, 2016b). Public water banks have the lowest overall price per unit and price per acre-foot, but with the lowest number of units transacted to date. Private water banks account for the highest cost per unit and cost per acre-foot, and include the highest number of units transacted. Private water banks appear to the be the most productive based on the number of units transacted, but the units transacted is skewed in favor of private water banks based on the nature of regulatory actions related to rural growth and scale of Upper Kittitas County in the Yakima Basin. A summary of transaction differences between public and private banks is shown on Table 1. Figure 8 provides a summary of the locations and types of water banks operating in Washington.

Table 1. Summary of Price of Water charged by Public/Private Water Banks (transactional fees not included)

	Cost of Water/Unit	Cost/acre-foot consumptive
Public		
Average	$920	$1,290
Minimum	$60	$3,600
Maximum	$1,700	$1,000
Quasi-government/NGO		
Average	$1,500	$7,350
Minimum	$1,000	$3,600
Maximum	$2,000	$11,100
Private		
Average	$5,250	$41,600
Minimum	$1,250	$27,000
Maximum	$10,000	$131,200

Notes:
Excludes annual rate programs and lease programs
Data collected through spring 2015

The prices in Table 1 reflect both water-bank seeding and water-bank administration/permitting costs. For the purposes of this study, we have assumed that water rights could be acquired for $10,000/acre of land as a rough estimate. In practice, actual acquisition price may be higher or lower than this number, subject to local market conditions.

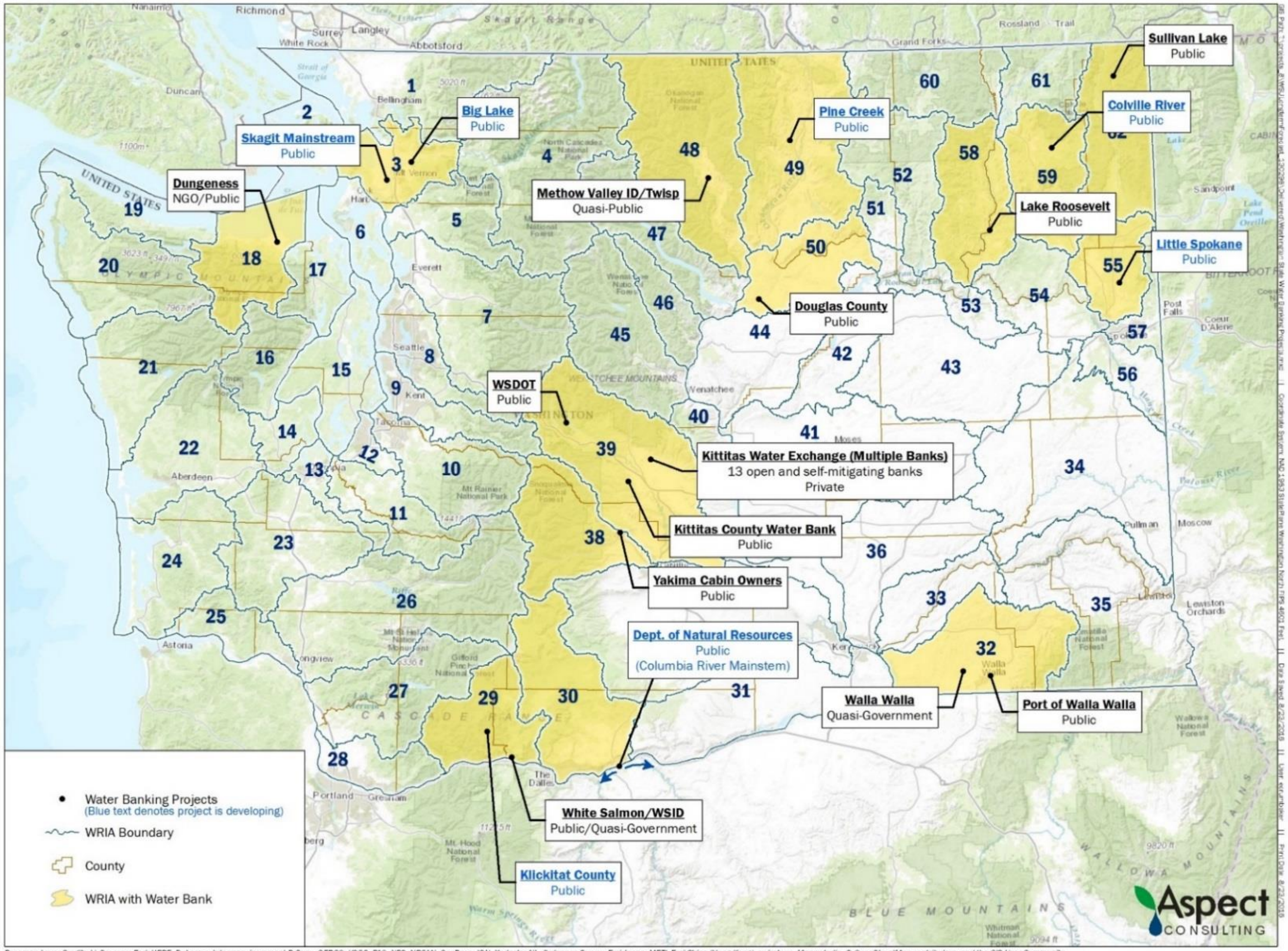

Figure 7. Water Banking in Washington State by WRIA

Price, or the amount of money paid for one unit (not including fees), and volume of units transacted is highly variable between water-banking models, as shown in Table 1 (WSU/Aspect/UU 2016).

1.9 Evaluation of Four Active Water Banking Models

To provide additional detail on how different water banks were formed and have influenced the market, the following sections summarize four different water banks.

1.9.1 Yakima Basin Cabin Owners (Public)

The Yakima Basin Cabin Owners (Cabin Owners) water bank is a public water bank operated by Ecology. Washington State Senate Bill 6861, with an effective date of June 7, 2006, provided guidance to Ecology to develop a water bank to solve curtailment issues associated with junior Cabin Owners water needs by providing administrative and seed funds to develop the water bank. Ecology seeded this bank with a senior irrigation water right they purchased, and are using Reclamation's Storage Exchange Contract to convert the seasonal right to year-round authority. Because there is robust storage in the basin that is managed to meet federal instream flow targets, they can manage it and mitigate instream flow impacts from Cabin Owners for year-round uses based on seasonal irrigation-bank seeding. As of 2016, Ecology has conveyed 200 units of mitigation at a rate of $60/unit and $3,600/acre-foot consumptive.

More information is available at http://www.ecy.wa.gov/programs/wr/cro/sb6861.html.

1.9.2 Dungeness Water Exchange (Public/NGO Partnership)

The Dungeness Water Exchange is a public/NGO partnership water bank operated by Clallam County and Washington Water Trust (WWT). The Dungeness Water Management Rule, Chapter 173-518 WAC, went into effect on January 2, 2013, and required new uses of groundwater to be mitigated. Ecology provided administrative and seed funds to develop the water bank through the acquisition of senior irrigation rights, which were, in this case, appropriate because it was determined that mitigation was not necessary outside the irrigation season. A portion of the bank involves development of infrastructure projects to retime and recharge high-flow events to augment base flow through groundwater augmentation. As of 2016, WWT and Clallam County have conveyed an estimated 50 units of mitigation at a rate of $1,000/unit and $11,100/acre-foot consumptive.

More information is available at http://www.washingtonwatertrust.org/water-exchange and http://www.ecy.wa.gov/programs/wr/instream-flows/dungeness.html.

1.9.3 Walla Walla Water Exchange (Quasi-government)

The Walla Walla Water Exchange is a quasi-government water bank operated by the Walla Walla Watershed Management Partnership (WWWMP). The Walla Walla River Basin Rule, Chapter 173-532 WAC, was amended in September 2007 to require new outdoor irrigation uses of groundwater under the permit exemption to be mitigated. Ecology provided state administrative and seed funds to develop the water bank through the acquisition of senior irrigation rights. Only irrigation season offsets are being provided, so the use of irrigation rights for bank seeding is appropriate. As of 2016, WWWMP has conveyed less than 10 units of mitigation at a rate of $2,000/unit and $3,600/acre-foot consumptive.

More information is available at http://www.wallawallawatershed.org/partnership/participate/138-wb-ewmp.

1.9.4 Yakima Basin Water Exchanges (Private Sector)

The Yakima Basin Water Exchanges are predominately a series of private water banks operated by for-profit corporations. The Yakima Basin Water Exchanges began when Ecology enacted a series of emergency groundwater rules in Upper Kittitas County beginning on July 16, 2009, requiring all new permit exempt groundwater uses to be mitigated. On January 22, 2011, Ecology formalized the permanent Upper Kittitas Ground Water Rule, Chapter 173-539 WAC, cementing groundwater mitigation requirements.

The State of Washington, through Ecology, has used public funds to provide regulatory administrative services (issuing Water Budget Neutral Determinations) and regulatory oversight, but has not participated in the development of water banks. Private investors have seeded their own water banks and manage all of the administration. Seeding has occurred through acquisition of senior irrigation rights, and either the use of the Bureau of Reclamation Storage Exchange Contract to cover off-season impacts, or use of private on-site storage-and-release ponds for off-season mitigation. As of 2016, the 11 private water banks in the Yakima Basin have conveyed an estimated 700 units of mitigation at rates ranging from $1,250 per mitigation unit, $41,600/acre-foot consumptive, to $10,000 per mitigation unit, $72,900/acre-foot consumptive.

More information is available at http://www.ecy.wa.gov/programs/wr/cro/wtrxchng.html.

1.10 Water Bank Operational and Management Considerations

There are a number of operational and management elements that must be considered when considering the “business” of developing and managing a water bank. Those elements include water-banking roles, services, business decisions, and design. These elements are important because they will dictate who the water bank serves, water-bank pricing, sustainability and longevity, and managing the resource amongst other competing demands.

1.10.1 Water Bank Roles

When considering the operating structure of a water bank, there are many different roles and responsibilities that are required by the formation, operation, and maintenance of a water bank. These roles can be handled completely by one entity or responsibility can be delegated to separate entities with different timelines.

Some water-bank roles include:

- Deciding on the water-bank model
- Developing water-bank framework and implementation
- Seeking funding

- Seeding the water bank
- Constructing projects/funding for seeding activities
- Operating the water bank
- Integrating the water bank with current county business functions
- Ensuring customers use the water bank
- Marketing the water bank

The CCNRD is capable of providing all of these roles in the Mission Basin, although it would be an expanded effort over current management of the reserve.

1.10.2 Water Bank Services

Water banks can fill a variety of services when it comes to meeting out-of-stream and instream water demands. Each water bank model will dictate who the water bank will eventually serve and for what reason.

1.10.3 Water Bank Business Decisions

When developing a water bank, the CCNRD will need to consider a number of different business options regarding how to functionally operate the water bank. These issues are often resolved through County ordinances coupled with input from citizen's and policy advisory groups. Here are some of the common business decisions CCNRD could face in setting up a water bank:

- **Who to serve –** What types of mitigated uses will be allowed? Understanding the customer the bank is trying to reach is critical for bank success.
- **Where to serve –** Which geographic region(s) to serve? Should services be limited to particular regions (e.g., Mission Basin)?
- **Quantities available for sale –** What is the water unit size(s) for sale? There are trade-offs to consider between bank longevity and what the bank sells. This typically manifests itself in discussions and policies regarding allowable lawn size, since consumptive-use impacts from outdoor lawn watering have the biggest impact on debits from the bank.
- **New uses/Existing uses –** What existing uses will be allowed? Will all exempt and permitted uses be allowed initially by the bank (e.g., domestic, lawn irrigation, agricultural irrigation, commercial/industrial use, and stock watering), or will some be prioritized over others (e.g., domestic uses first)?
- **Pricing and Packages –** How much to charge? Will different mitigation packages be offered to accommodate multiple customer values or will customers be expected to conform to a single land-use choice? Will there be difference in price between indoor-only vs. outdoor uses to incentivize smaller lawn sizes? How will other uses be priced (e.g., stock water, commercial/industrial uses)? Will pricing be flat rate or include an escalator to incentivize conservation? How will use be verified (e.g., individual meters, aerial photo review)?

- **Cost recovery –** Will cost recovery include water/development cost and/or administration? Will administrative costs be recovered? Price signals undoubtedly affect bank participation, although a regulatory imperative will soften the price reaction.
- **Longevity/Sustainability –** How long will the water bank operate with a particular project or water-right seeding? In general, the less the bank tries to accommodate individual user preferences, the longer a particular mitigation source seeding the bank will last. For example, requiring new uses to conform to new construction standards (e.g., water use-efficient appliances), small lawn sizes, and conservation-based indoor uses would stretch bank seeding the furthest. Allowing variable lawn sizes (e.g., with commensurately higher consumptive use), more generous indoor allowances, and including existing uses (which may have less-efficient practices or larger water needs) will all reduce bank longevity or require more frequent bank seeding.
- **Bank administration –** There are trade-offs between customer choices and ease in bank administration. In general, the more a bank tries to accommodate individual customer preferences, the more complex it is for a bank to operate, the higher the administrative cost, and the greater the effort it takes to ensure compliance (e.g., code enforcement).

Each of these choices has potential impacts on the departments within the County that will need to interact with the water bank. Table 2 summarizes some of the key banking functions and the potential departments within each county that could have a participatory role:

Table 2. Summary of Potentially Affected County Departments under Water Banking

Chelan County	Formation	Operations	Management
Natural Resources Department	X	X	X
Auditor		X	X
Treasurer	X	X	
Public Works		X	X
Assessor		X	
Community Development	X	X	X
Flood Control Zone District			

1.10.4 Water Bank Design

As an institution, a water bank can be designed to accomplish various public-interest goals of value to the region. For example, the bank can be designed to prevent exceedingly high water market prices, moving too much water from one region to the next (e.g., upstream to downstream, tributary to mainstem), moving too much water from one user group to another (e.g., agriculture to municipal, or rural-growth limitations), speculative hoarding of mitigation credits, and other undesirable conditions. CCNRD could decide to engineer limitations by adopting business rules on the marketplace to ensure sustainability into the future. Essentially, this is a trade-off between free market principles and social engineering around what is perceived to be "fair" or of value in the Mission Basin. For example, some guidelines or business rule topics could include:

- Establishing water pricing standards
- Defining mitigation credit unit size
- Defining specific quantities to preserve or to develop incentives to access, such as price breaks
- Reserving tributary basin water for in-tributary basin use only or allowing portability for reverse transfer of mitigation credits back to their point of origin
- Determining the degree to which administrative costs are discounted, if at all
- Creating trading zones divided up by tributaries, control points, or subwatersheds
- Establishing market longevity goals (i.e., perpetuity, short-term, long-term)
- Develop a Citizen's Advisory Board to review policy issues

The importance of these business rule topics is typically a function of four factors:

1) How much water is available for bank seeding? The more water that is available, the less important the need to adopt stringent business rules that will promote bank longevity.
2) How is the basin managed? The terms of agreement between the water bank and Ecology relative to basin management may influence the importance of tributary versus mainstem reservations.
3) How variable is rural demand? If demand in rural areas can be classified into one or two mitigation credit sizes that represent the super-majority (e.g., 90 percent) of homes, then customer response to fewer mitigation credit offerings will be favorable and administrative costs will be less.
4) How cost-effective are the mitigation credits? The cost of mitigation credits relative to standard connection fees for municipal systems, and relative to the overall cost of new home construction, will help determine whether pressure for administrative cost subsidies will arise.

1.10.5 Building Permit Processes

A key change anticipated to be needed if CCNRD creates a water bank will be educating both county staff and the public on how the water-banking process intersects with the building-permit process, along with filing and recording of mitigation certificates. Under the current Mission Creek reserve framework, Chelan County debits building-permit issuances to the reserve, and no other accounting is required. Under a new water bank, if current county models are followed, Chelan County would issue mitigation certificates that would be recorded against the parcel demonstrating that suitable mitigation has been provided. It may also be possible to amend the rule and "add quantities" to the existing reserve and retain the current banking system, but rule amendments may be more challenging to obtain than a trust water agreement.

1.10.6 New Compliance Efforts under Water Banking

Depending on the types of mitigation certificates sold and assumptions and quantities on which they are based, various levels of new compliance and code enforcement could be imposed by the County as part of a water bank. These could include the following:

- **Rural metering or water-use monitoring.** To ensure that mitigation certificates are offsetting new uses, some level of monitoring of new uses is typical. This could include standard metering of wells, which under Ecology's metering rule (WAC 173-173) would be read on at least a monthly basis with annual totals reported annually. Another option would be to have the County compile water-use information on a 5-year interval, which was the negotiated framework between Ecology and Chelan County under the Wenatchee IRPP (WAC 173-545). This reporting approach is not necessarily metered, and would include aerial-photo and crop-duty estimates for lawn use.
- **Exceedance of mitigation certificates.** Compliance with mitigation certificates can either be at the individual user level or at the bank level. Some water banks require individual user compliance with reporting to Ecology (e.g., private banks in Kittitas County). Other water banks (e.g., Kittitas County Public Health) have selected bank compliance, because it allows for some attenuation of individual customer issues, while still being protective of the overall bank purpose. For example, if a bank presumes an average person/household residency, there will be some homes with more and some homes with less people, with water use varying accordingly. Bank-wide compliance would help the County avoid unnecessary enforcement situations where a mitigation certificate for three people per house is being compared against a six-person/house residency, because elsewhere in the bank there is likely a one-person/house offsetting use.
- **Lawn size.** This is the code enforcement issue that is the most straightforward to track, and the one that is likely to most affect the water bank because of the consumptive nature of the use. If a water bank selects a small outdoor irrigation footprint (e.g., 500 square feet), compliance could be generally enforced through infrequent "windshield" surveys or aerial photo review.

Irrespective of who operates the bank and how it is seeded, there will likely be some increased code enforcement administration that the County must assume to provide regulatory agencies and third parties confidence that the bank is operating as assumed.

1.11 Opportunities for a Targeted Water Right Purchase

Aspect evaluated potential rights that could seed a water bank in the Mission Basin. These same rights have the potential to assist in several other alternatives being evaluated in this study, including surface to ground transfers or being exchanged for another source (e.g., regional purveyor, Wenatchee pump station). Based on a review of Ecology's water-right files, the following water rights were determined to be large enough to warrant consideration for inclusion in this study.
Table 3 provides a summary of these rights.

Table 3. Select Surface Water Rights

Water Right Number	Water Right Type	Priority Date	Instant. Rate (cfs)	Instant. Quantity (gpm)	Annual Volume (acre-feet)	Irrigated Acres	Purpose
S4-004798CL	Claim L		372		320	150	DG IR ST
S4-070227CL	Claim L		0.08		160	40	IR ST
S4-061757CL	Claim L				1.6	40	DG IR
S4-113247CL	Claim L			11	17.6	40	IR
S4-028032CL	Claim L			120		28	IR
S4-151518CL	Claim L			60	13	27	IR
S4-103438CL	Claim L	1/01/1885	0.4		102	32	IR ST
S4-033395CL	Claim L		0.313		113	25	IR
S4-300897CL	Claim		1		5	24.8	IR
SWC08901	Cert	1/11/1963	0.41		80	20	DS IR
S4-093712CL	Claim L			25	15	20	IR
S4-115791CL	Claim L					20	DG IR
S4-200113CL	Claim L			100	70	20	IR
S4-032694CL	Claim L		0.5		80	20	IR
S4-040923CL	Claim L		1		64	16	IR ST
S4-118425CL	Claim L			120	32	16	IR
S4-038034CL	Claim L		0.16		61	15	DG IR
S4-136262CL	Claim L			50	10	12	IR
S4-007884CL	Claim L					40	IR
S4-122677CL	Claim L		0.12		10	10	IR
S4-200126CL	Claim L		26		35	10	IR
S4-116134CL	Claim L			60	40	10	IR
S4-200147CL	Claim L		1		10	10	DG IR
S4-200148CL	Claim L		1		10	10	DG IR
S4-057797CL	Claim L				36.57	7.17	IR
S4-057796CL	Claim L				48.3	9.47	IR
S4-301810CL	Claim		0.02		872	8.74	NR

Notes: DG – Domestic General; IR – Irrigation; ST – Stock Watering; NR – Not Recorded

These water rights were adapted into a Mapbook in Google Earth that summarizes their attributes, locations, overlays the authorized places of use with parcel landowners, and estimates current irrigation (Attachment 1).

Aspect and CCNRD met with local landowners to review this information and determine their interest in potentially participating in one or more of the alternatives being evaluated in this study. During the course of reviewing the Mapbook, it became apparent that, in many cases, the actual location of irrigation did not perfectly line up with the authorized (or asserted-for claims) places of use outlined in the Mapbook. As such, in some cases, the estimates of current use underpredict actual use. Generally, irrigating outside one's place of use is still considered beneficial use under Ecology's Tentative Determination Policy 1120, although a change authorization is needed to correct the irrigated area. If one of the rights in the Mapbook were selected for acquisition, in whole or in part, then a formal tentative determination of the extent and validity of the water right would be accomplished at that time.

1.12 Estimated Cost

Launching a new Mission Basin water bank will include costs to seed, administer, and start up the bank. These costs can be challenging to predict, given the uncertainty in local market conditions and the degree to which County departments can readily integrate the new business function. For the purposes of this analysis and building on a previous evaluation done by Aspect on potential acquisitions for CCNRD (Aspect 2012), Table 4 depicts potential bank seeding, bank longevity, and mitigation certificate costs scaled by different levels of acquisition.

Because the amount of water associated with each exempt use in the Mission Basin is relatively small, and assuming that this trend continues (or is forced to continue through banking rules), then a relatively small irrigation acquisition could allow for modest predicted growth to continue for decades to come. Prices would likely be affordable based on the mitigation certificate analysis and assumptions presented in Table 4.

Permitting costs are tied to the number of water rights acquired to seed the water bank. Transactional costs to transfer an acquired water right into the bank is estimated at $10,000 per water right with an additional cost of $2,500 associated with trust conveyance negotiations (Table 5). Administration of the water bank is estimated to cost 25 percent of the bank-seeding costs, or approximately $2,500 per house or $5,500 per consumptive acre-foot. In this example, it is assumed a single transaction would cover the quantities necessary to offset 10 acres of outdoor irrigation.

Table 4. Bank Seeding and Potential Mitigation Certificate Costs

Outdoor irrigation covered under an alternative authorization (acres)[1]	Reserve quantity made available (September consumptive use equivalents, cfs)	Number of homes supported[2]	Mission Basin growth rate from Watershed Management Plan (homes/year)	Years reserve depletion is delayed	Reserve depletion date[3]	Bank Seeding Costs[4]
1	0.005	5	6.9	1	2018	$10,000
2	0.01	10	6.9	1	2018	$20,000
3	0.015	15	6.9	2	2019	$30,000
4	0.02	20	6.9	3	2020	$40,000
5	0.025	26	6.9	4	2021	$50,000
6	0.03	31	6.9	4	2021	$60,000
7	0.035	36	6.9	5	2022	$70,000
10	0.05	51	6.9	7	2024	$100,000
15	0.075	77	6.9	11	2028	$150,000
20	0.1	102	6.9	15	2032	$200,000
25	0.125	128	6.9	18	2035	$250,000
30	0.15	153	6.9	22	2039	$300,000
35	0.175	179	6.9	26	2043	$350,000

Notes:

1) The Interim Mission Basin reserves are established as 0.03 cfs. Alternative authorizations might include water from irrigation purveyors, State-based water rights, water banking, etc.

2) Number of homes supported considering combined indoor and outdoor September consumptive use per residence of 0.00098 cfs (630 gpd) for Mission Basin (Aspect, 2013).

3) Mission reserve was estimated to be depleted in 2013 (Aspect, 2013).

4) Acquisition is estimated at $10,000 per acre, and water bank administration is anticipated to be quarter the cost of bank seeding.

Table 5. Water Banking Cost Estimate Summary

Alt	Description	Capital Cost	20-year O&M	Permitting Costs	Total Costs	Costs per Acre-Foot
1	Water Banking[a]	$100,000	--	$12,500	$112,500	$5,500

Notes:

a) Costs reflect bank seeding for 23 acre-feet as shown in Table 6, costs do not include administrative and start-up costs.

Recommendations and Next Steps

Water banking is a viable option for extending the Mission Creek reserve and providing opportunities for new growth. As shown in Table 4, a modest investment to seed a water bank could supply domestic water for new growth for years to come. It offers some limited benefit to improving instream flows as well. However, the magnitude of water needed to meet instream flow targets is substantially higher, so it is unlikely that water banking alone would be a solution for both of the issues (instream and out-of-stream) currently facing Mission Creek. Likely, water banking in conjunction with another option would be most beneficial.

In order to launch a water bank for Mission Creek, Aspect recommends the following key next steps:

1) Meet with local stakeholders, including landowners who have rights that could seed the bank to discuss how the bank would operate and quantities of water targeted.
2) Meet internally with County departments to review how new bank procedures would overlay with current county business practices.
3) Meet with Ecology to discuss how a trust water agreement and permitting framework would be developed.
4) Identify a revenue source for an initial acquisition. Establish cost-recovery guidelines so the bank can be self-sustaining after initial seeding is complete.
5) Network with local landowners or run an auction to identify and acquire a water right.
6) Use the conservancy board or a front-loaded application process with Ecology to move the water right into trust and secure a trust water agreement for its management.
7) Develop outreach materials and building permit guidelines to offer new mitigated rights in the Mission basin.

References

Aspect Consulting, LLC (Aspect), 2012, Instream Flow Rule Implementation, Chumstick and Mission Creek Water Banking, memorandum prepared for Chelan County Natural Resources Department, Wenatchee, Washington. July 2, 2012.

Clifford, P., C. Landry, and A. Larsen-Hayden, 2004, Analysis of Water Banks in the Western States, Published by Washington State Department of Ecology available at www.ecy.wa.gov/biblio/0411011.

Howell, Terry, 2003, Irrigation Efficiency, Encyclopedia of Water Science.

Washington State Department of Ecology (Ecology), 2016a, Finding Rural Domestic Water Solutions While Protection Instream Resources, Publication Number 15-11-007.

Washington State Department of Ecology (Ecology), 2016b, 2016 Columbia River Basin Long-Term Water Supply and Demand Forecast, Publication Number 16-12-001.

Washington State Department of Ecology (Ecology), 2018, POL1210: Policy for the Evaluation of Changes to Enable Irrigation of Additional Acreage or the Addition of New Purposes of Use to Existing Water Rights.

Limitations

Work for this project was performed for the Chelan County Natural Resources Department (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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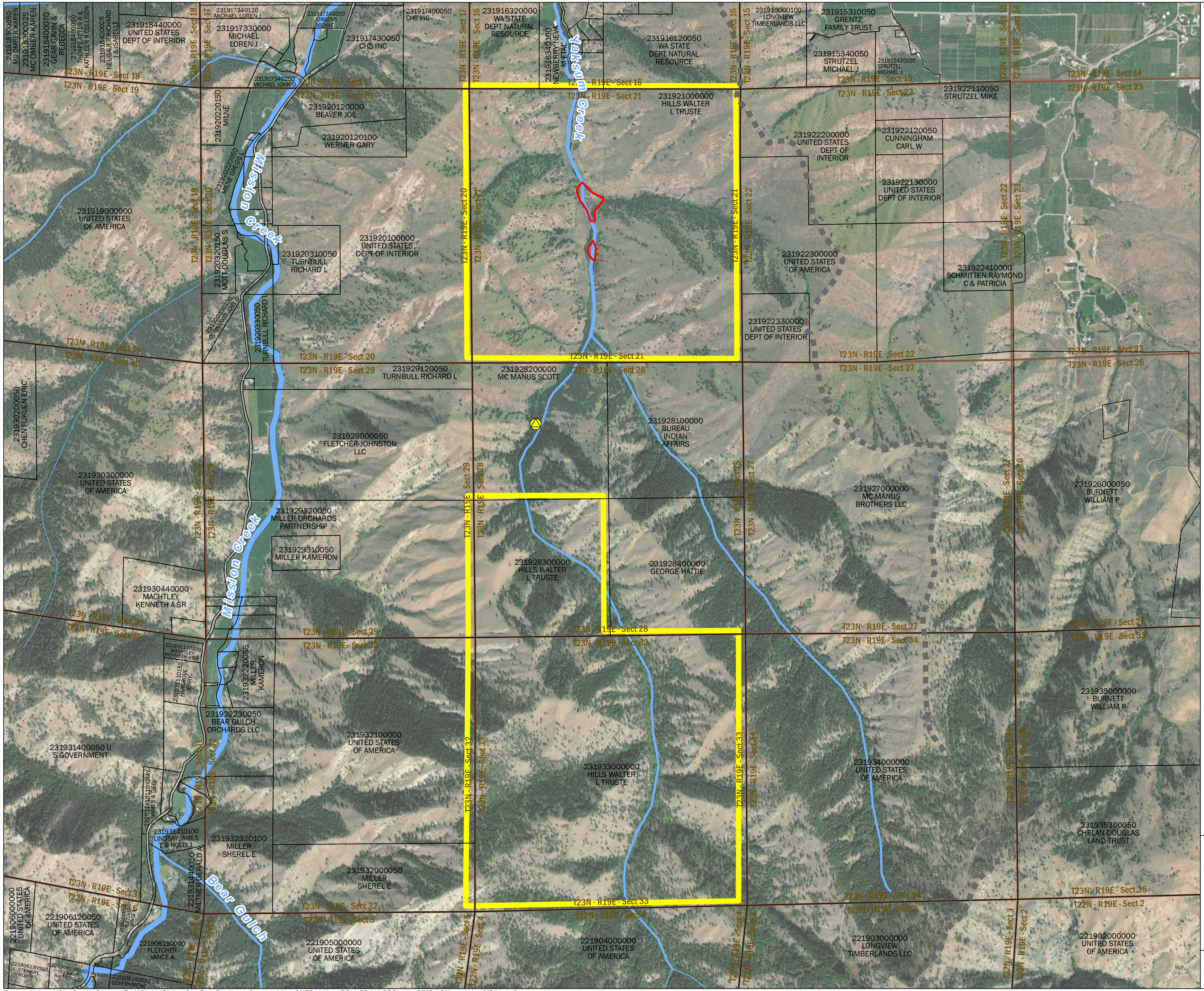
ATTACHMENT 1

MapBook – Mission Creek Basin Water Rights



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-004798CL
Water Right Type: Claim L
Purpose: Domestic (General), Irrigation, Stock Watering
Irrigated Acres: 150
Instantaneous Rate (cfs): 372
Annual Volume (acre-feet): 320
Name On Water Right: HILLS, WALTER L.

Note:

Irrigation ranges from 4.2 to 5.1 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

- Aerial Photo Delineated Irrigated Areas
- Water Right Place of Use (from Ecology GWIS)
- Approximate Point of Withdrawal for Given Water Right
- Sections
- Mission Creek Basin Boundary
- Tax Parcels

Mission Creek Basin

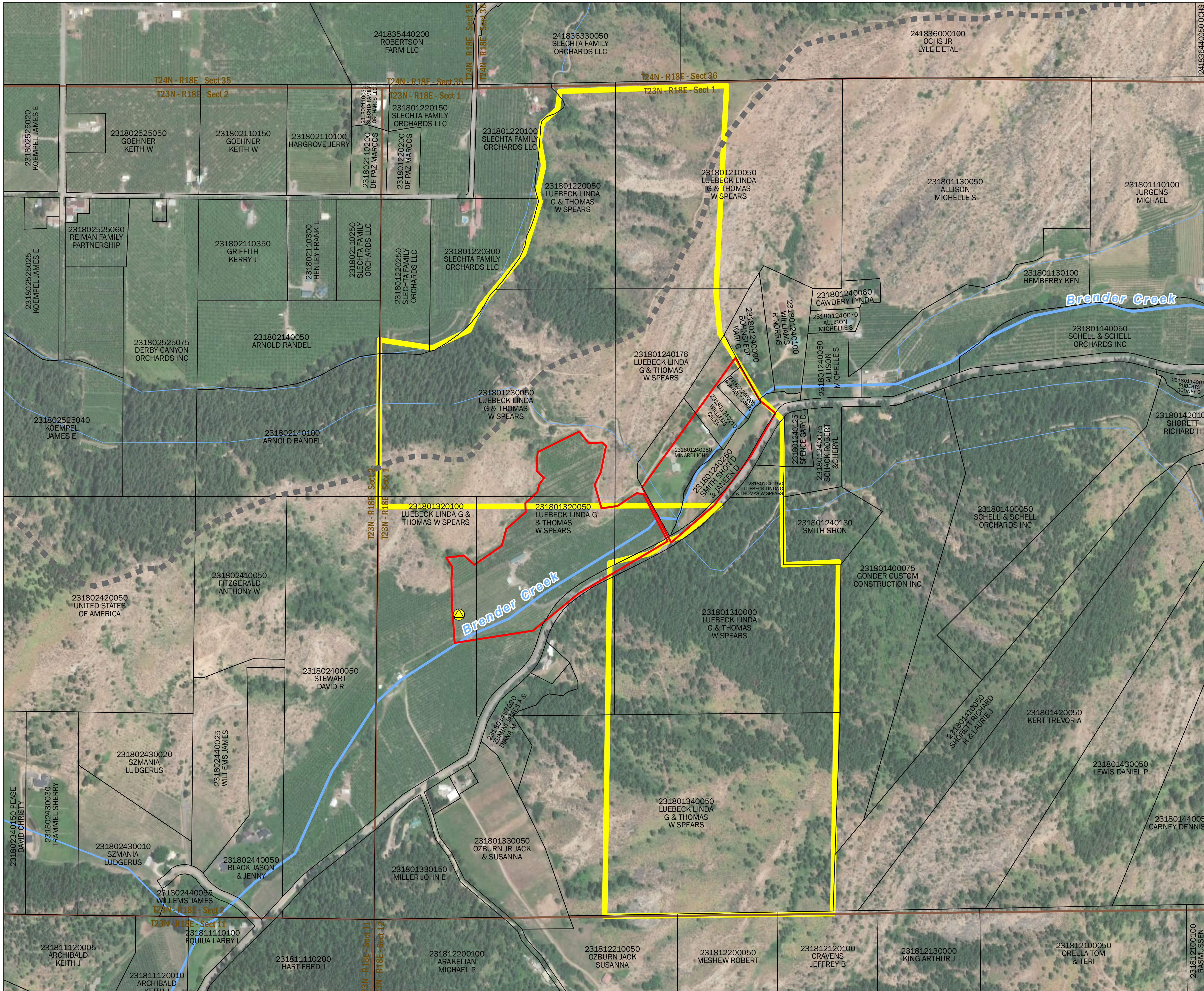
N

0 1,900 3,800
Feet

S4-004798CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect Consulting	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-1



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info

Water Right Number: S4-113247CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 40
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 17.6
Name On Water Right: SPEARS, BEVE T

Note:

Irrigation of approximately 30 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

0 625 1,250
Feet

S4-113247CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-2

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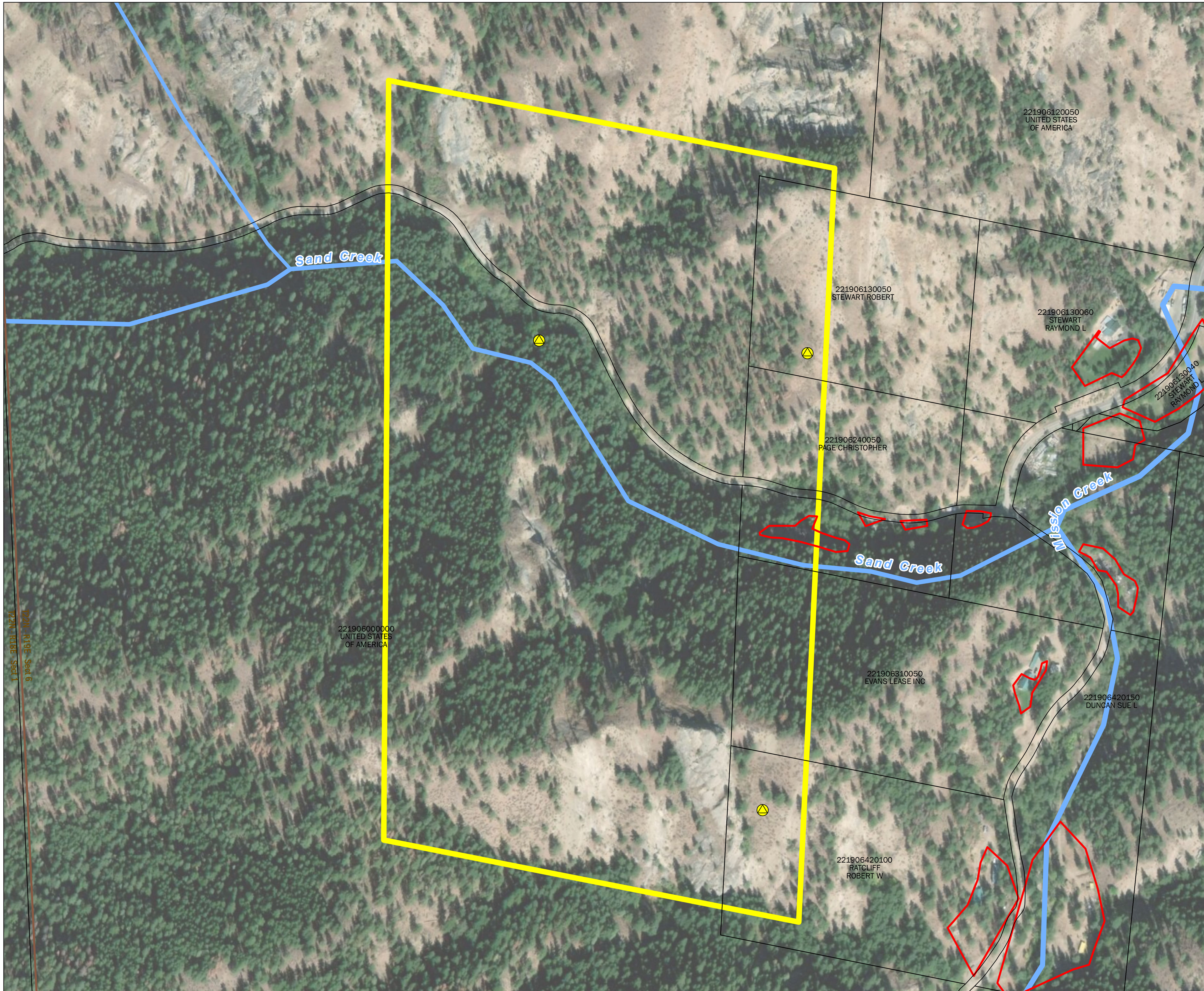

Water Right Document Info
Water Right Number: S4-070227CL
Water Right Type: Claim L
Purpose: Irrigation, Stock Watering
Irrigated Acres: 40
Instantaneous Rate (cfs): 0.08
Annual Volume (acre-feet): 160
Name On Water Right: STEWART, LEO

Note:

Irrigation ranges from 8.0 to 8.4 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

Mission Creek Basin

N

0 360 720
Feet

S4-070227CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW		FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP		A-3

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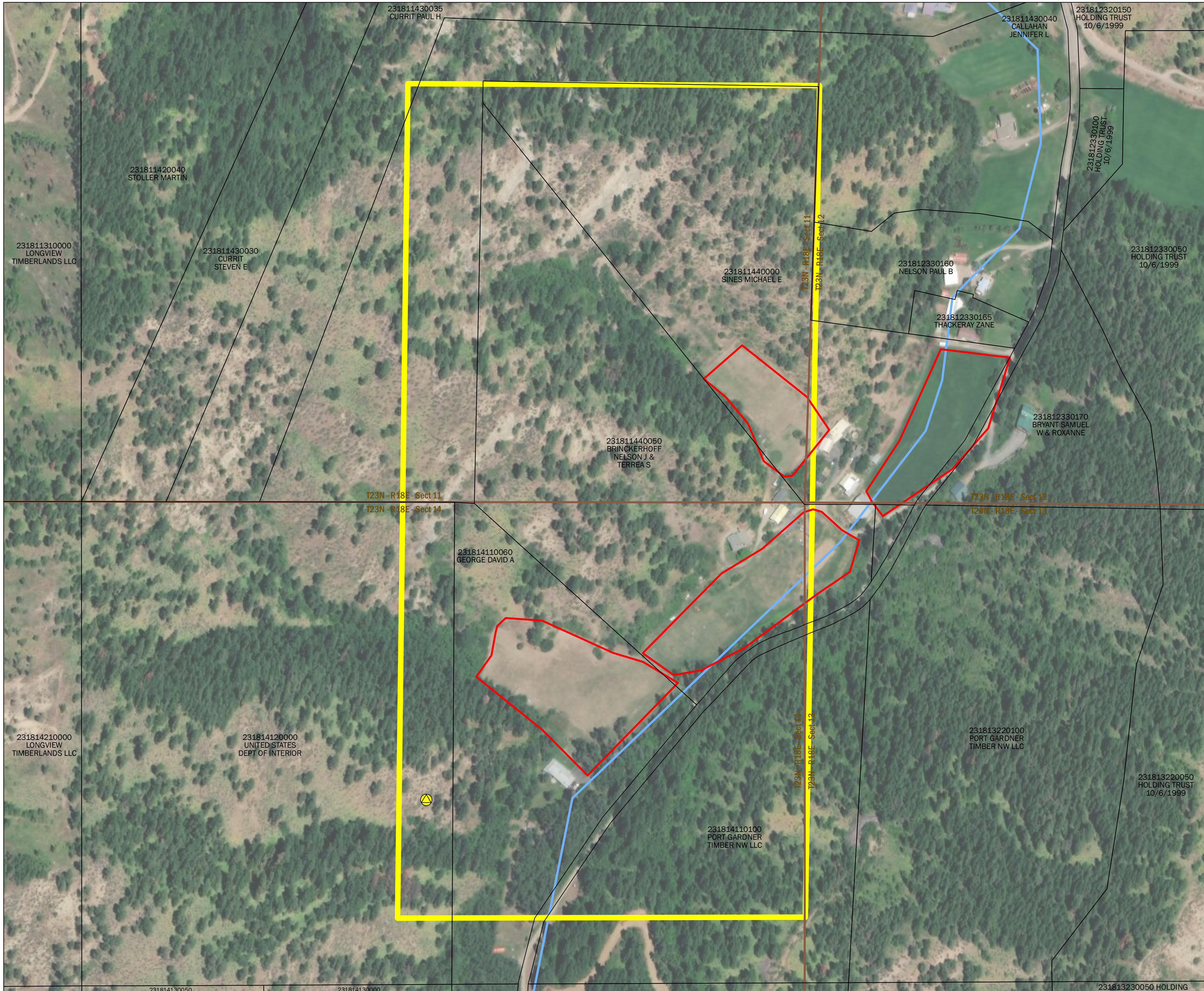

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-061757CL
Water Right Type: Claim L
Purpose: Domestic (General), Irrigation
Irrigated Acres: 40
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 1.6
Name On Water Right: ,

Note:

Irrigation ranges from 8.5 to 11.0 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

Mission Creek Basin

0 310 620
Feet

S4-061757CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-4

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Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-007884CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 40
Instantaneous Rate (cfs):
Annual Volume (acre-feet):
Name On Water Right: DEJONG, KARL H.

Note:

Irrigation ranges from 7.0 to 9.0 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-007884CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-5

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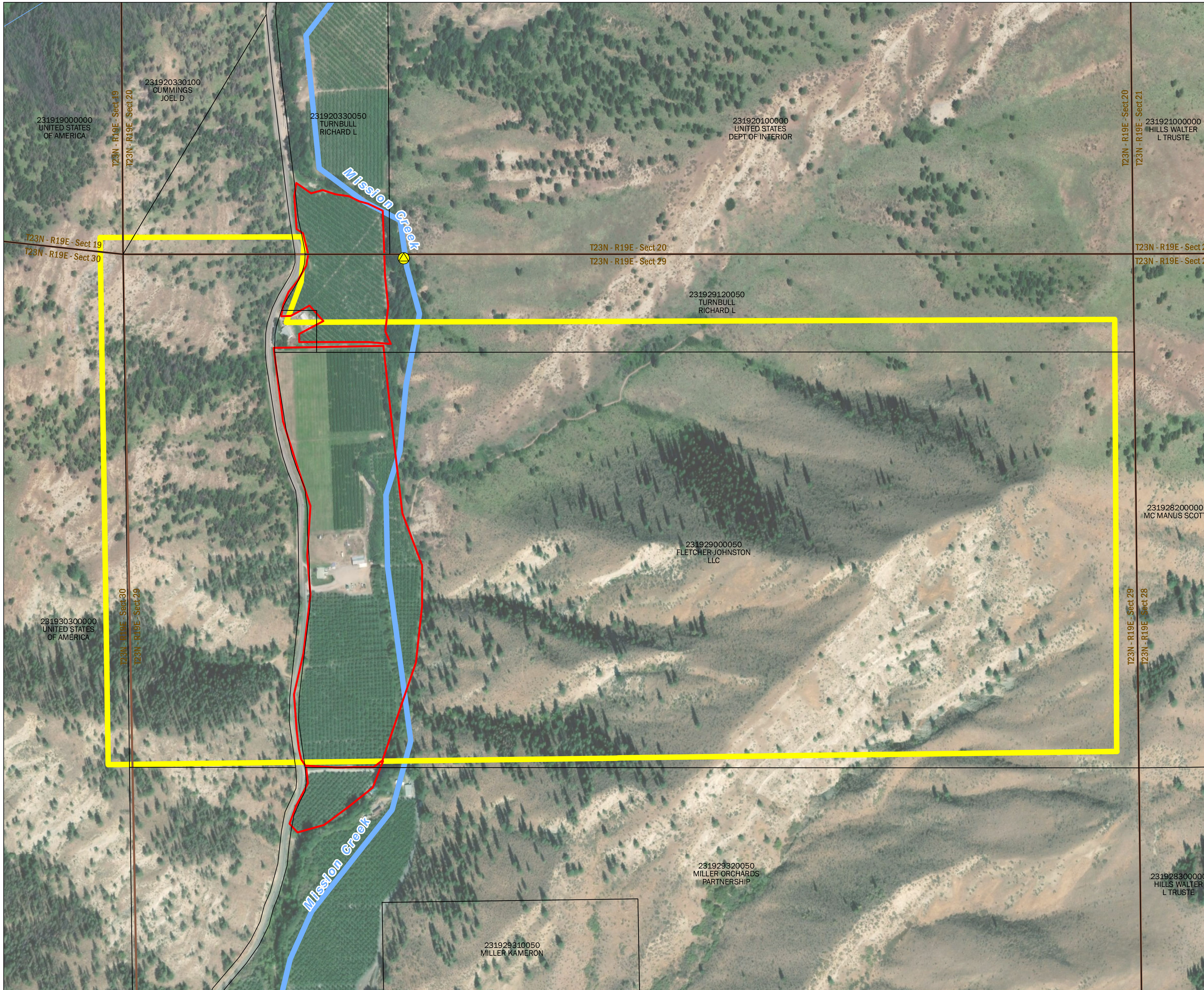


Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-103438CL
Water Right Type: Claim L
Purpose: Irrigation, Stock Watering
Irrigated Acres: 32
Instantaneous Rate (cfs): 0.4
Annual Volume (acre-feet): 102
Name On Water Right: MC WILLIAMS, ROBERT A

Note:

Irrigation of approximately 30.1 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

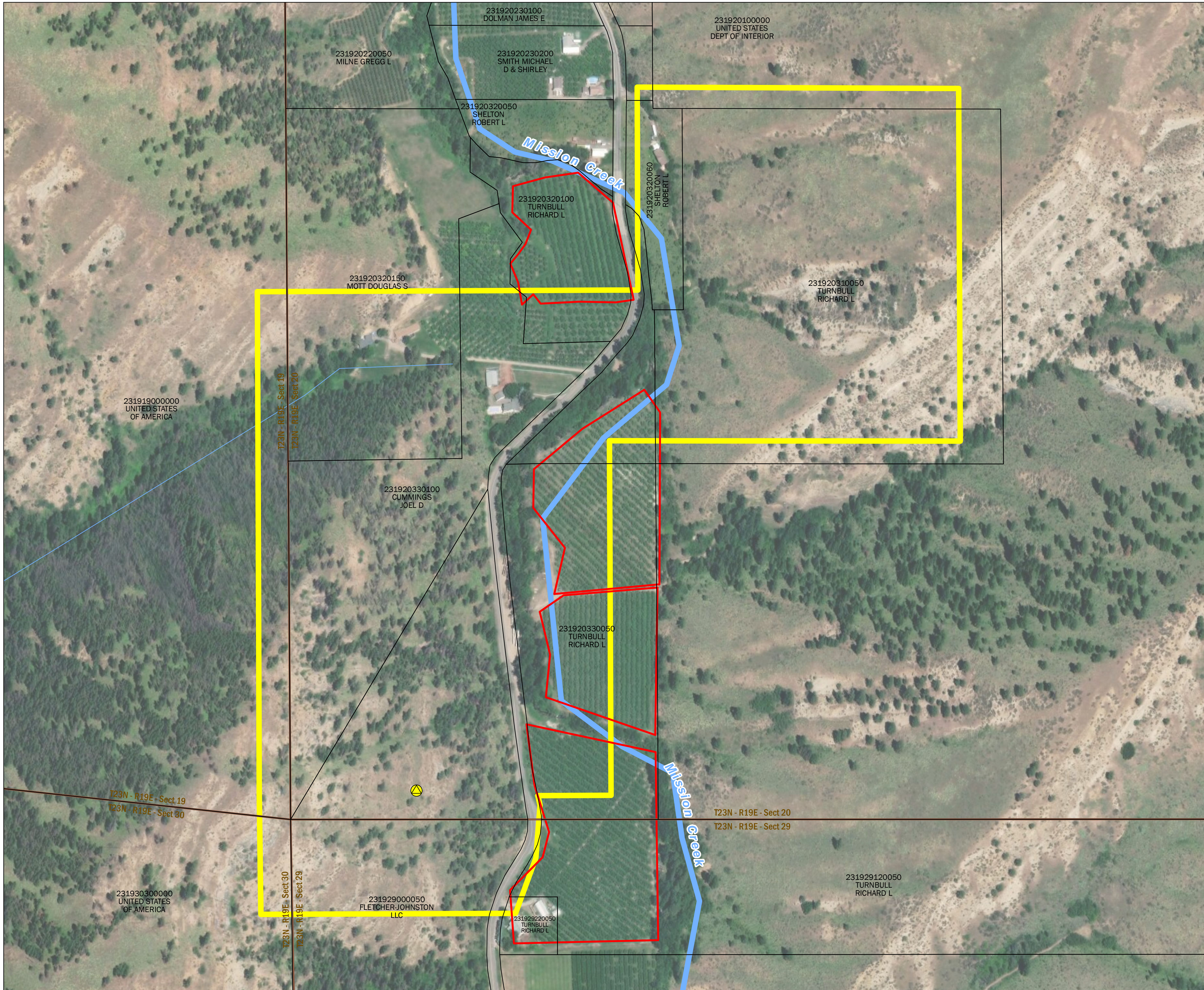
N

0 520 1,040
Feet

S4-103438CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-6



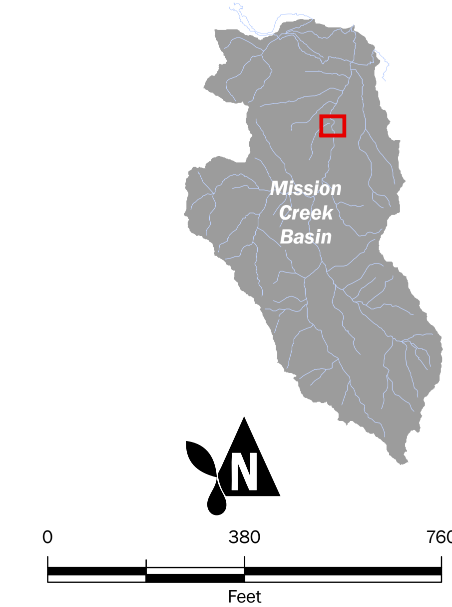
Water Right Document Info
Water Right Number: S4-028032CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 28
Instantaneous Rate (cfs):
Annual Volume (acre-feet):
Name On Water Right: WATERS, J. T.

Note:

Irrigation of approximately 28.6 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels



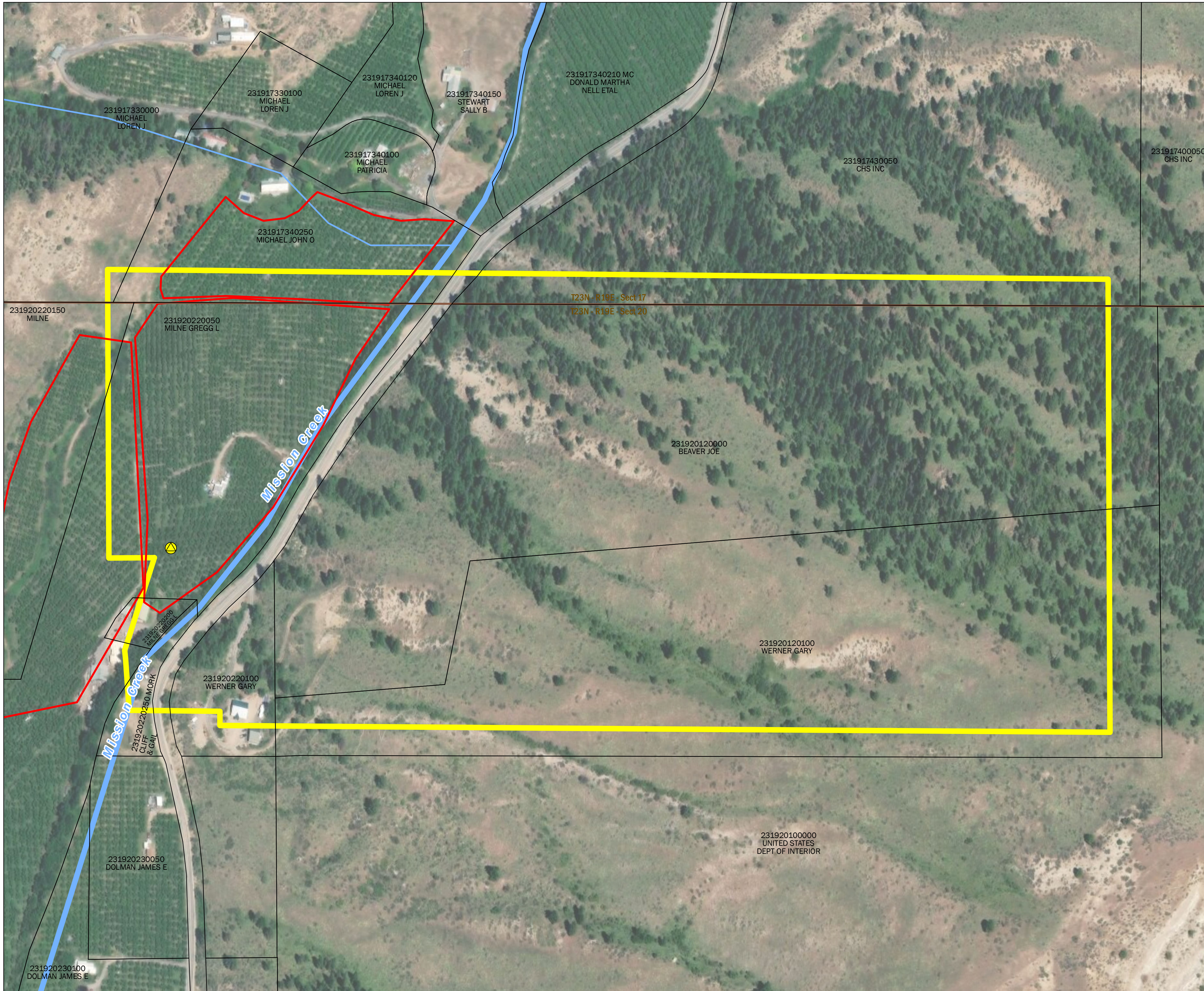
S4-028032CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-7

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-151518CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 27
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 13
Name On Water Right: MALLOCK, GEORGE E

Note:

Irrigation ranges from 19.6 to 24.2 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

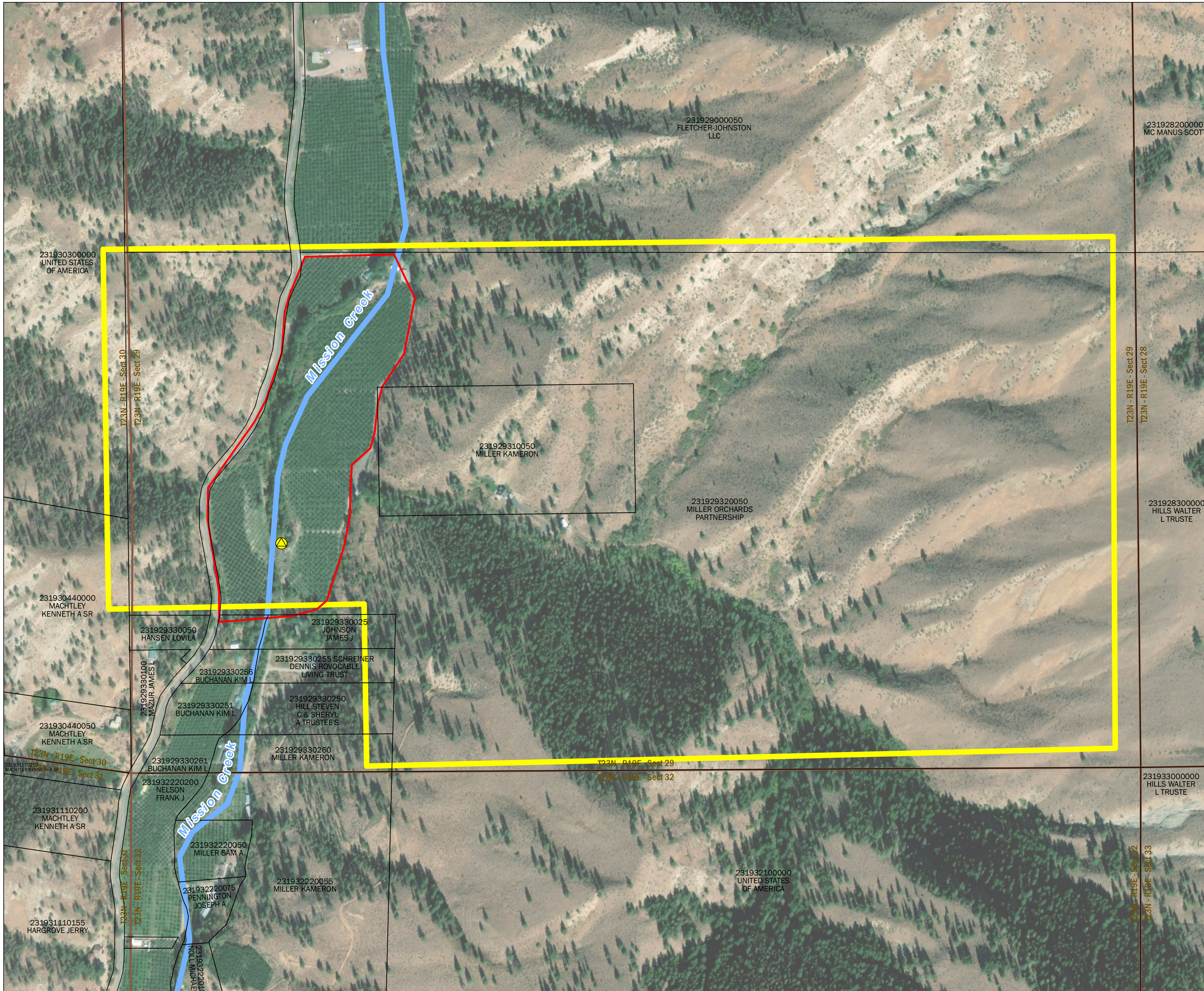
Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-151518CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-8

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045\009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: tnulen || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info

Water Right Number: S4-033395CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 25
Instantaneous Rate (cfs): 0.313
Annual Volume (acre-feet): 113
Name On Water Right: DOYLE, HOMER

Note:

Irrigation of approximately 29 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

N

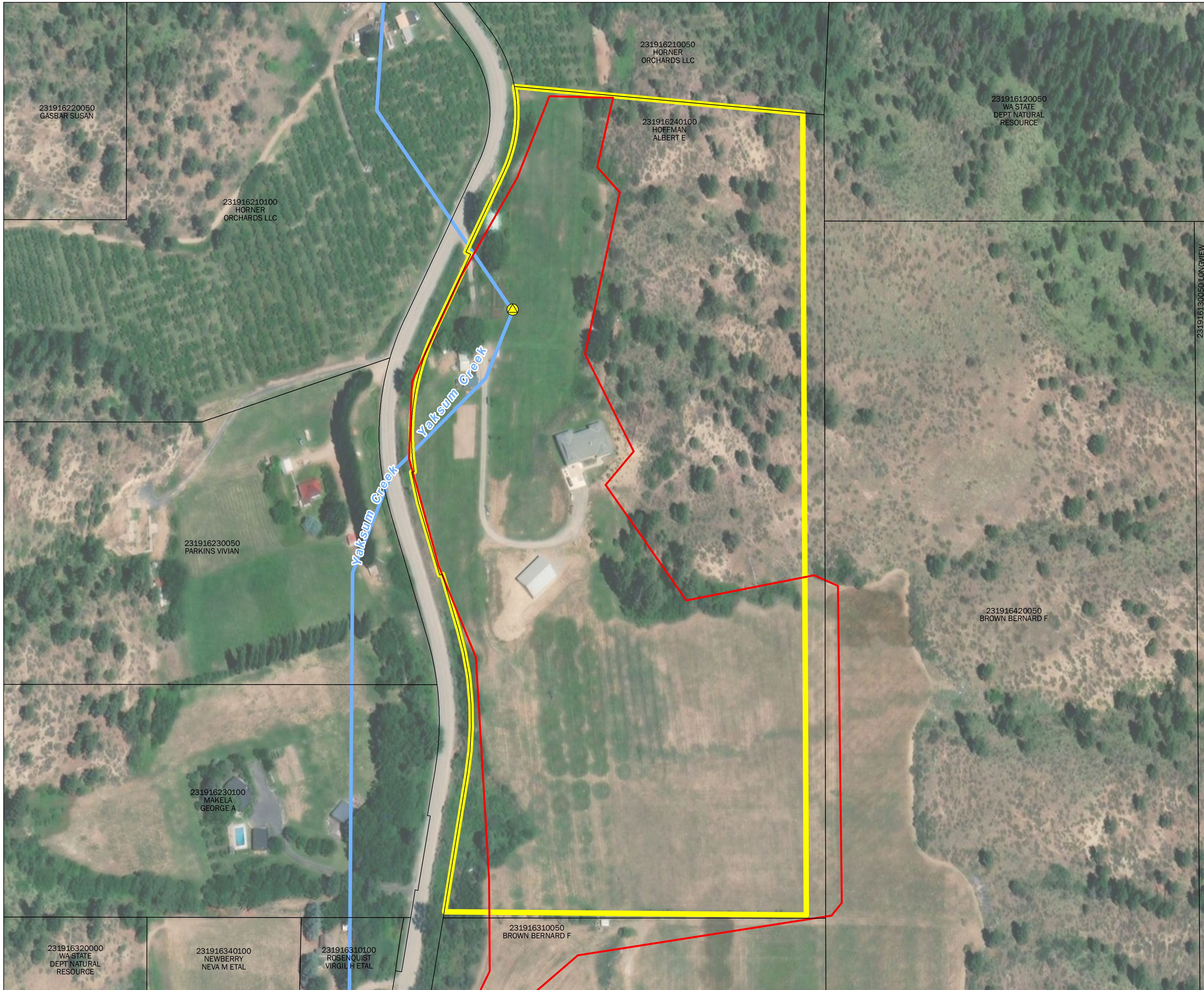
0 520 1,040
Feet

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045\009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: lnulen || Print Date: 7/5/2018

S4-033395CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-9



Water Right Document Info
Water Right Number: S4-300897CL
Water Right Type: Claim
Purpose: Irrigation
Irrigated Acres: 24.8
Instantaneous Rate (cfs): 1
Annual Volume (acre-feet): 5
Name On Water Right: HOFFMAN, MABEL

Note:

Irrigation of approximately 16.1 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

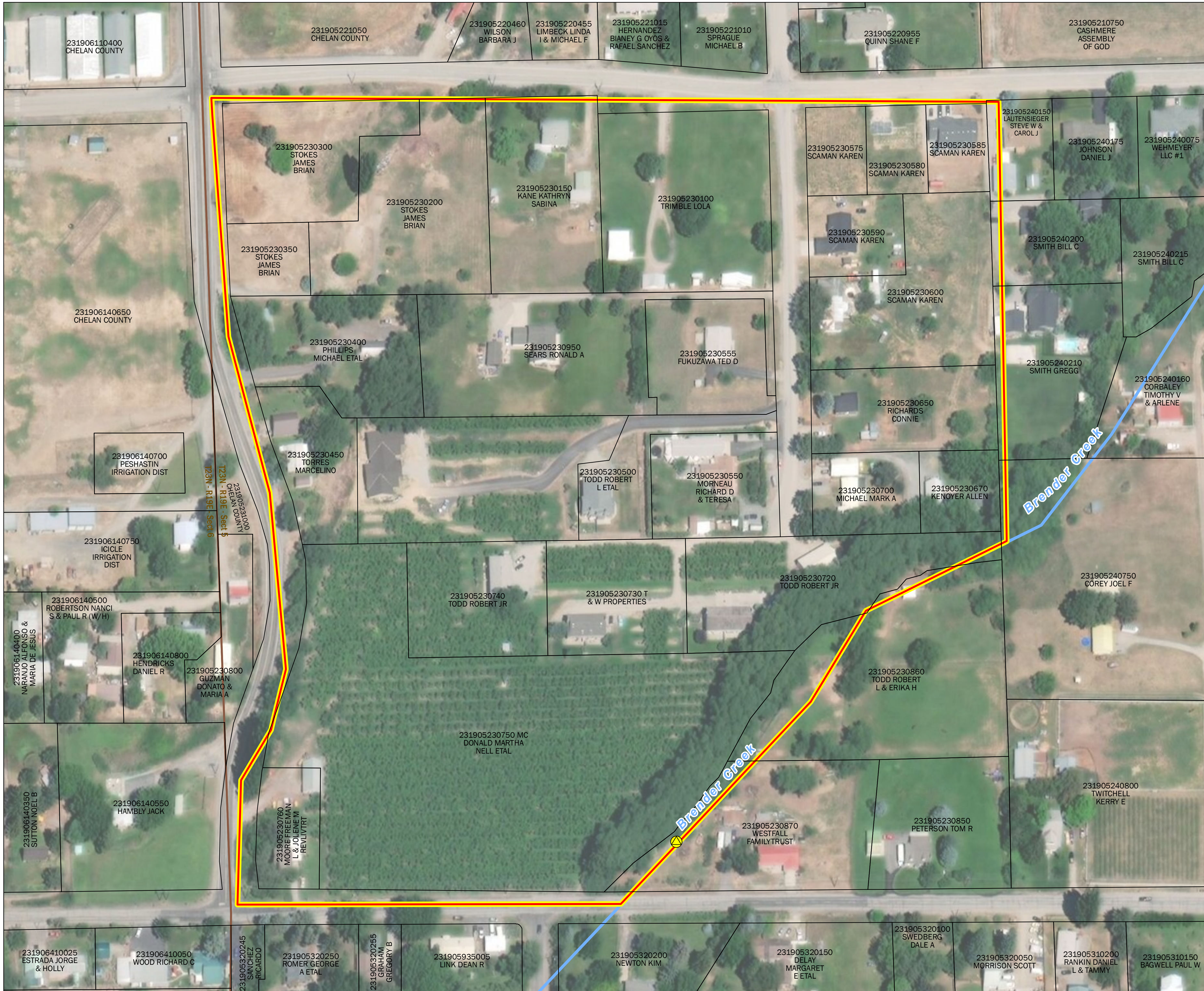
S4-300897CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	**A-10**

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: SWC08901
Water Right Type: Cert
Purpose: Domestic (Single), Irrigation
Irrigated Acres: 20
Instantaneous Rate (cfs): 0.41
Annual Volume (acre-feet): 80
Name On Water Right: ,

Note:

Irrigation ranges from 25.0 acres to 32.0 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

- Aerial Photo Delineated Irrigated Areas
- Water Right Place of Use (from Ecology GWIS)
- Approximate Point of Withdrawal for Given Water Right
- Sections
- Mission Creek Basin Boundary
- Tax Parcels

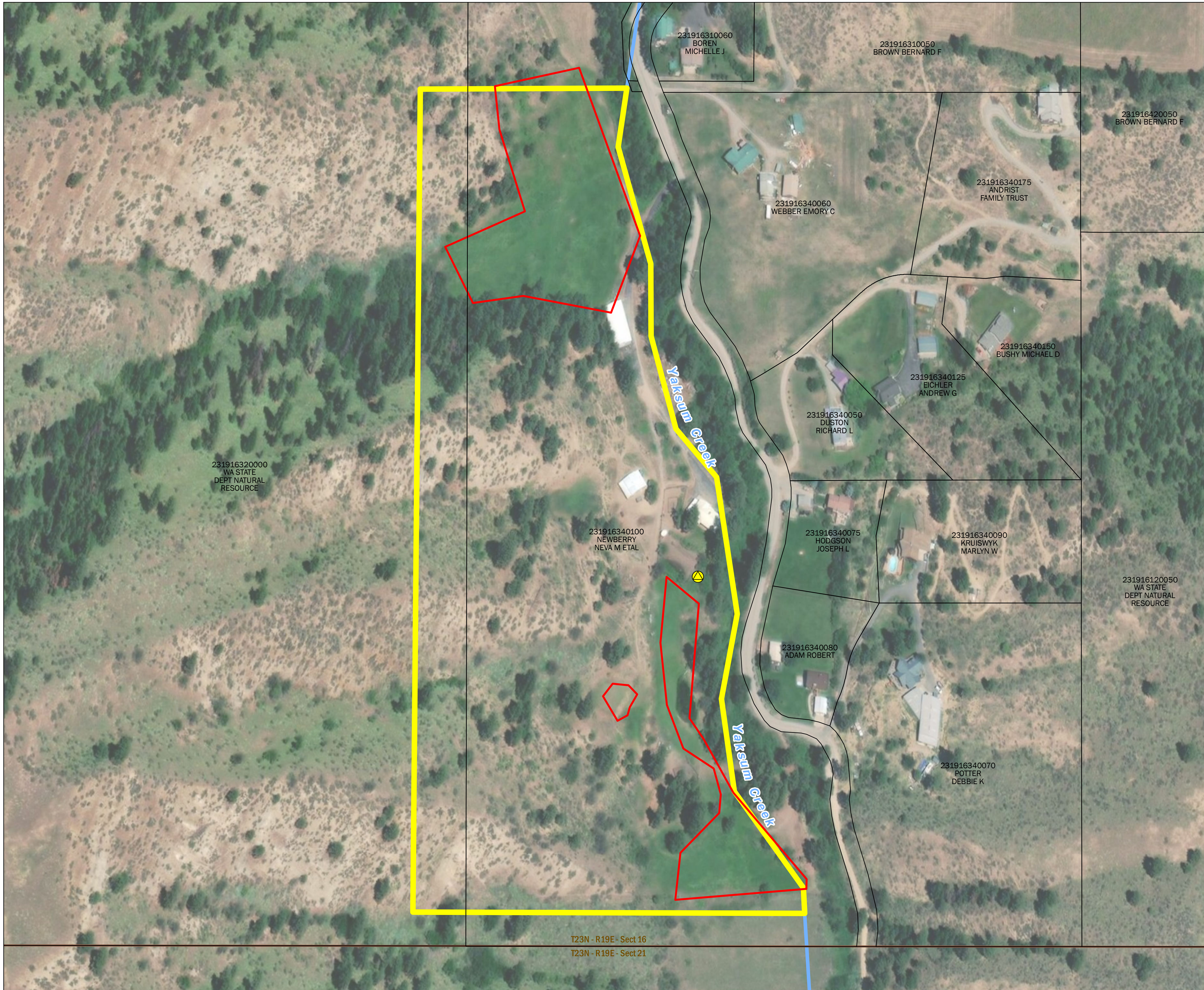
SWC08901

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-11

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045\009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: lruilen || Print Date: 7/5/2018



Water Right Document Info
Water Right Number: S4-200113CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 20
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 70
Name On Water Right: ,

Note:

Irrigation ranges from 1.0 to 4.8 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

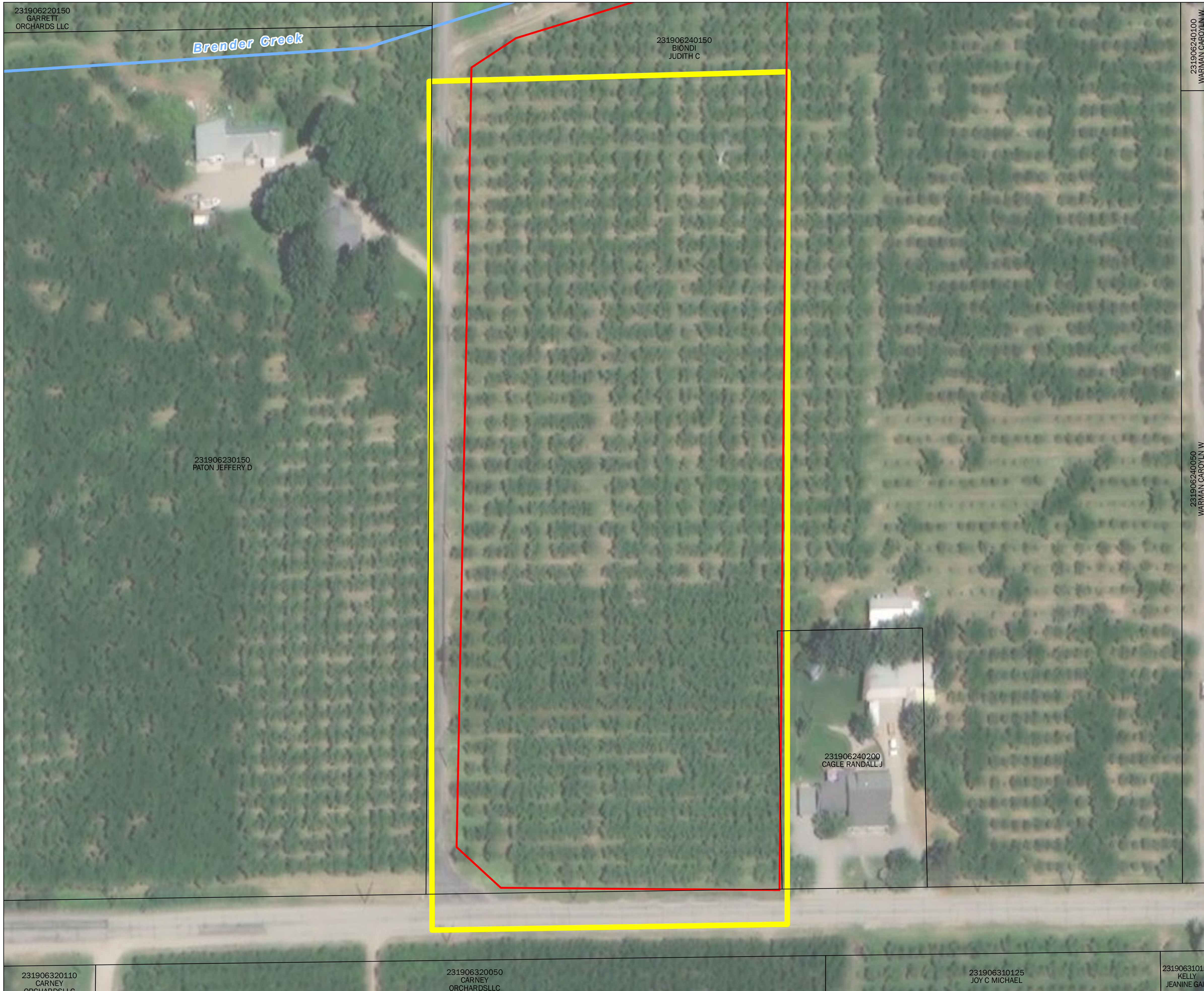
S4-200113CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-12

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



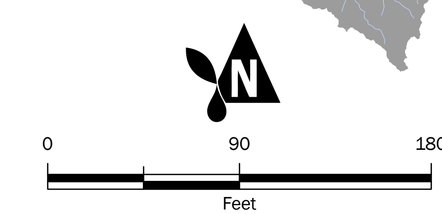
Water Right Document Info
Water Right Number: S4-115791CL
Water Right Type: Claim L
Purpose: Domestic (General), Irrigation
Irrigated Acres: 20
Instantaneous Rate (cfs):
Annual Volume (acre-feet):
Name On Water Right: SLECHTA, DOYLE B

Note:

Irrigation of approximately 5.8 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels



S4-115791CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-13

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

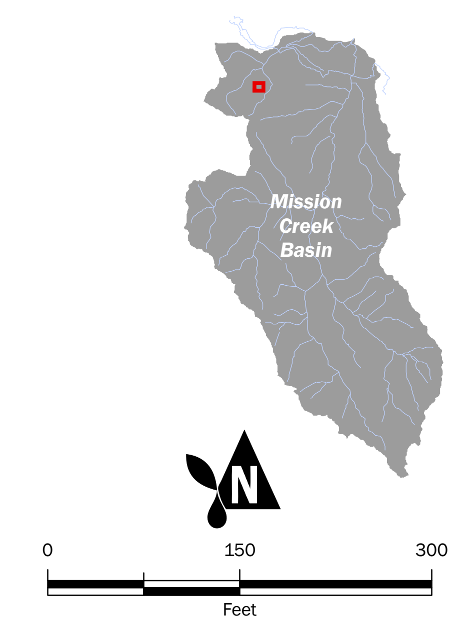
Water Right Document Info
Water Right Number: S4-093712CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 20
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 15
Name On Water Right: BRENDER, MELVIN B

Note:

There is no irrigation from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

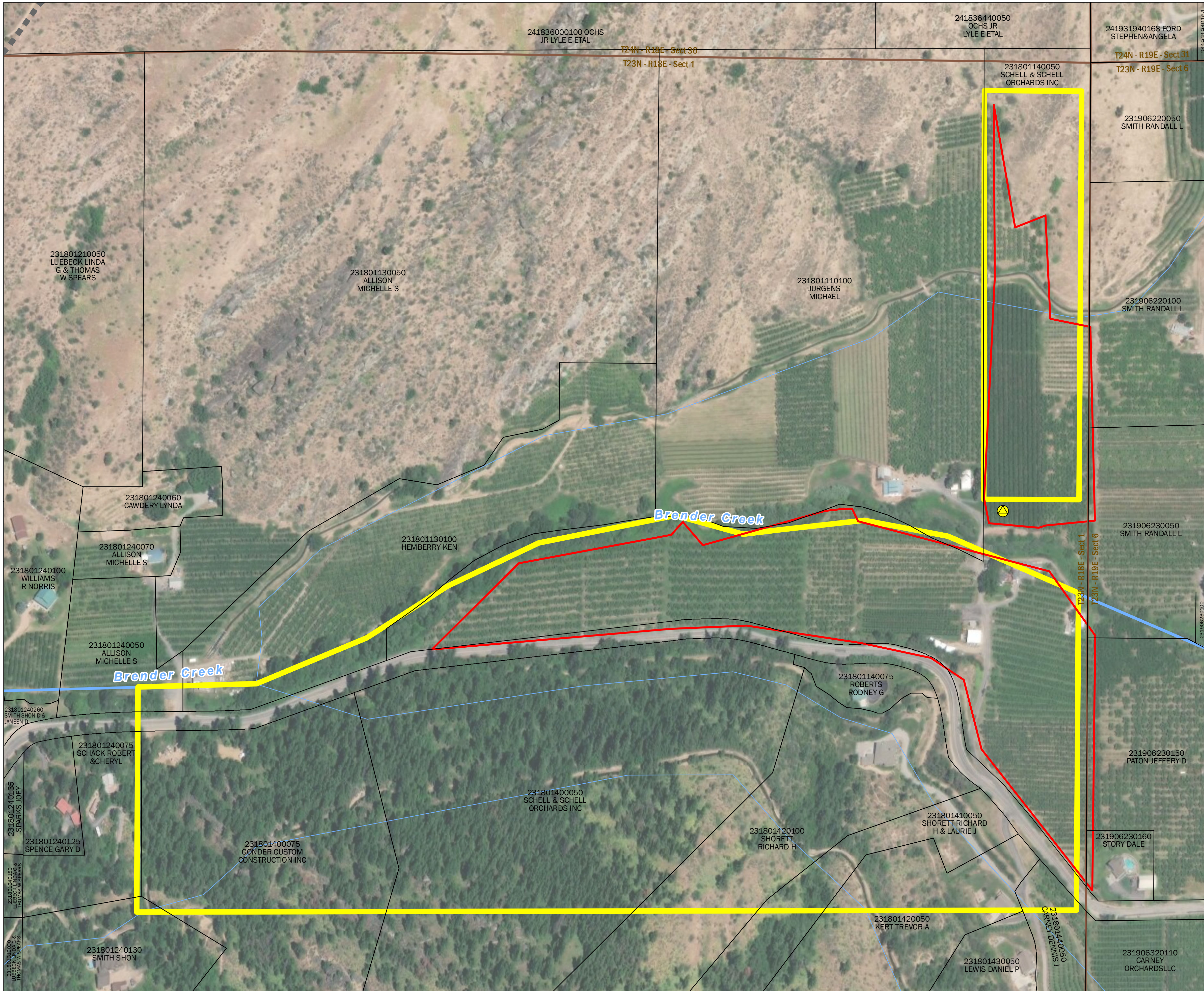


S4-093712CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-14

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info

Water Right Number: S4-032694CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 20
Instantaneous Rate (cfs): 0.5
Annual Volume (acre-feet): 80
Name On Water Right: SCHELL, A. ELIZABETH

Note:

Irrigation of approximately 22.8 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

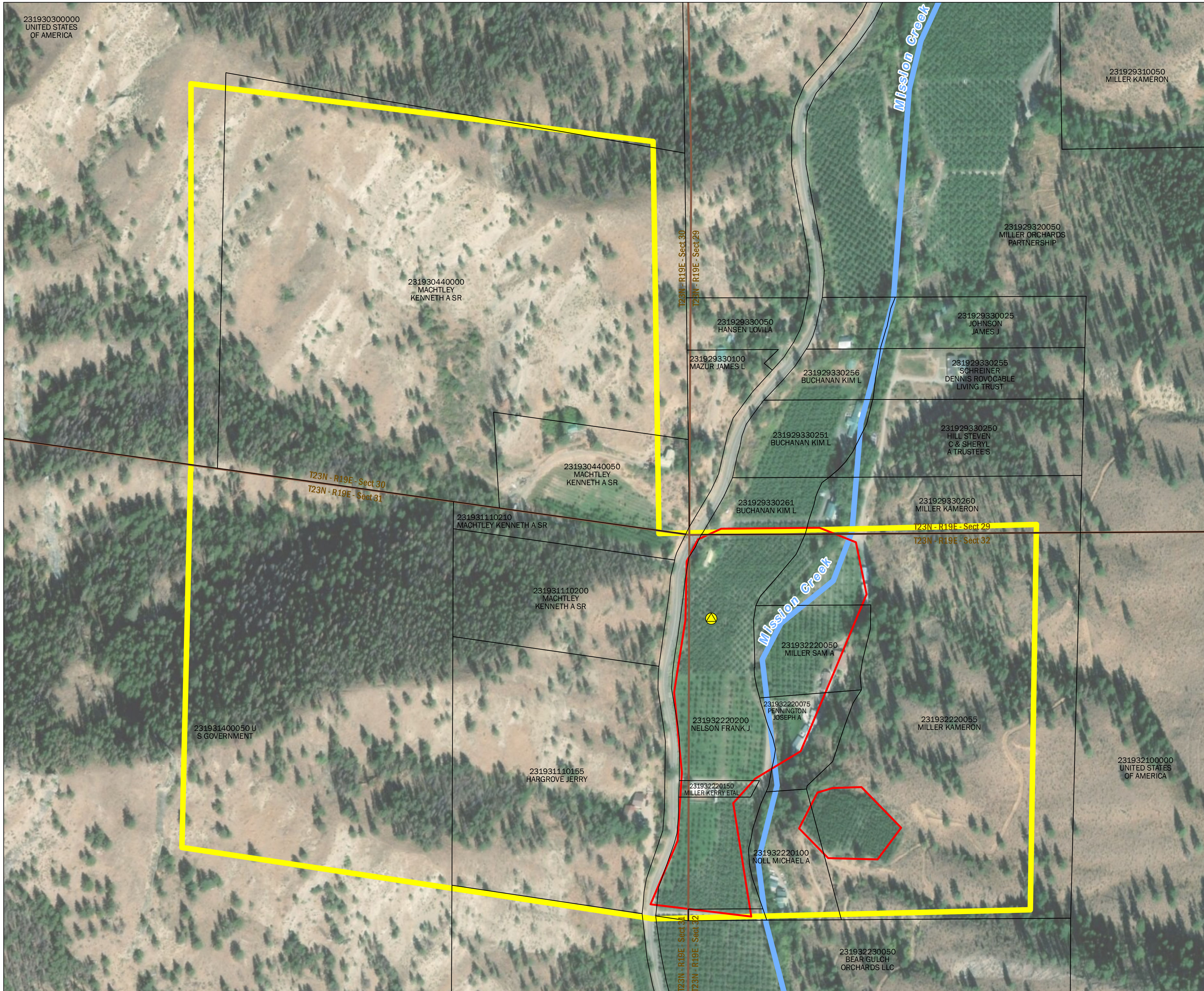
N
0 310 620
Feet

S4-032694CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-15

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045\009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: tnulen || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

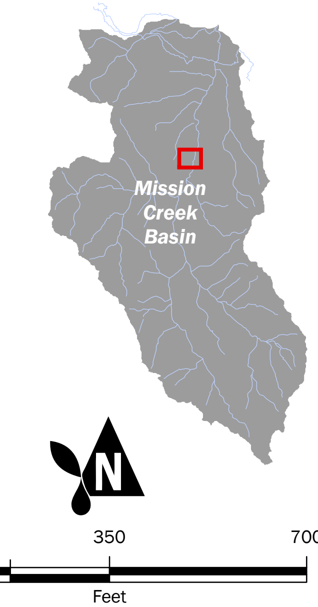
Water Right Document Info
Water Right Number: S4-118425CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 16
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 32
Name On Water Right: DOLMAN, C D

Note:

Irrigation ranges from 14.8 to 17.1 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

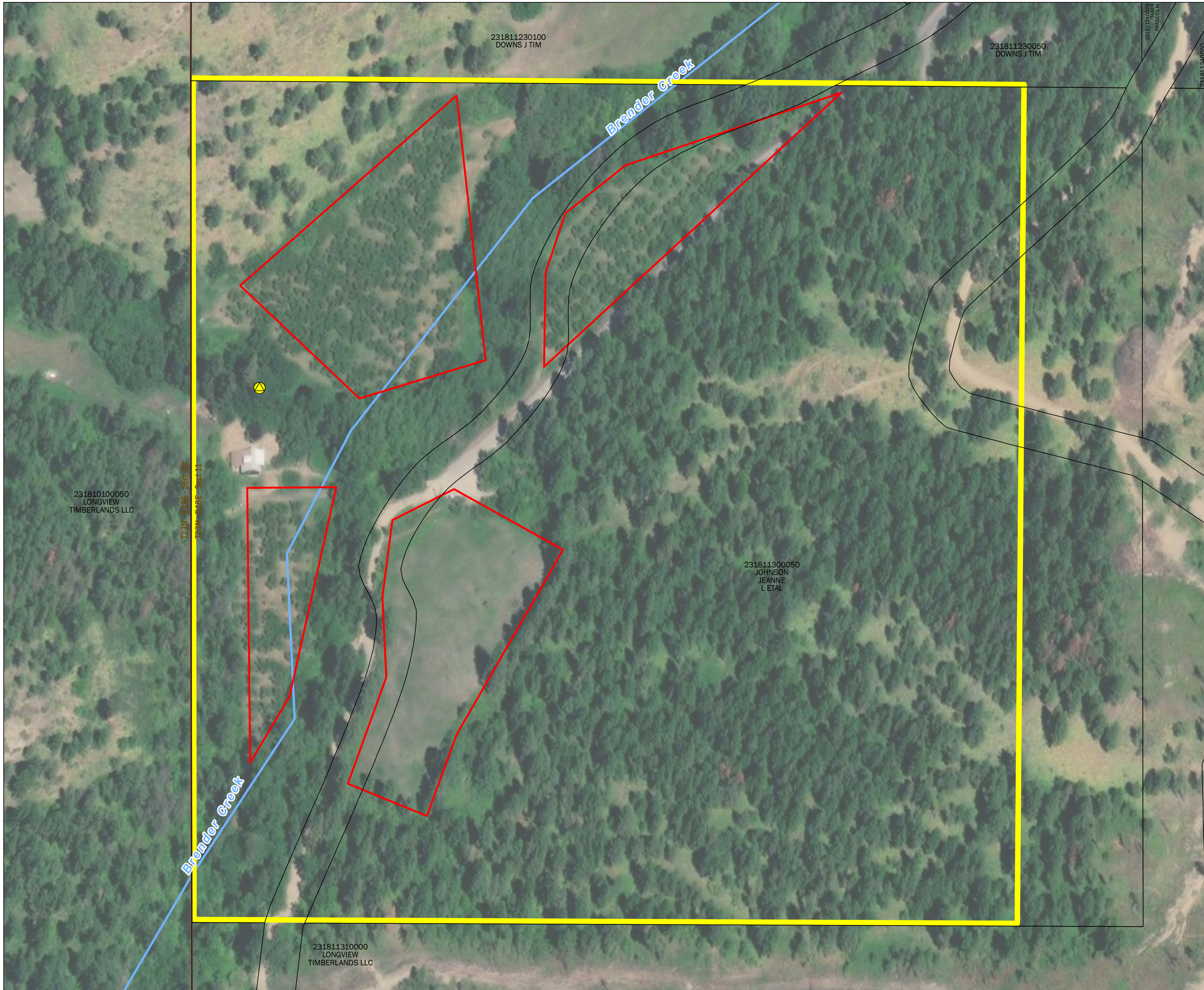


S4-118425CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-16

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



Water Right Document Info
Water Right Number: S4-040923CL
Water Right Type: Claim L
Purpose: Irrigation, Stock Watering
Irrigated Acres: 16
Instantaneous Rate (cfs): 1
Annual Volume (acre-feet): 64
Name On Water Right: TABER, WARREN D.

Note:

Irrigation of approximately 6.3 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

0 150 300
Feet

S4-040923CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018 PROJECT NO. 120045-009	BY: PPW REVISED BY: JE / RAP	FIGURE NO. **A-17**

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: tnolen || Print Date: 7/5/2018

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info

Water Right Number: S4-038034CL
Water Right Type: Claim L
Purpose: Domestic (General), Irrigation
Irrigated Acres: 15
Instantaneous Rate (cfs): 0.16
Annual Volume (acre-feet): 61
Name On Water Right: METCALF, DORTHY B.

Note:

Irrigation of approximately 16.8 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

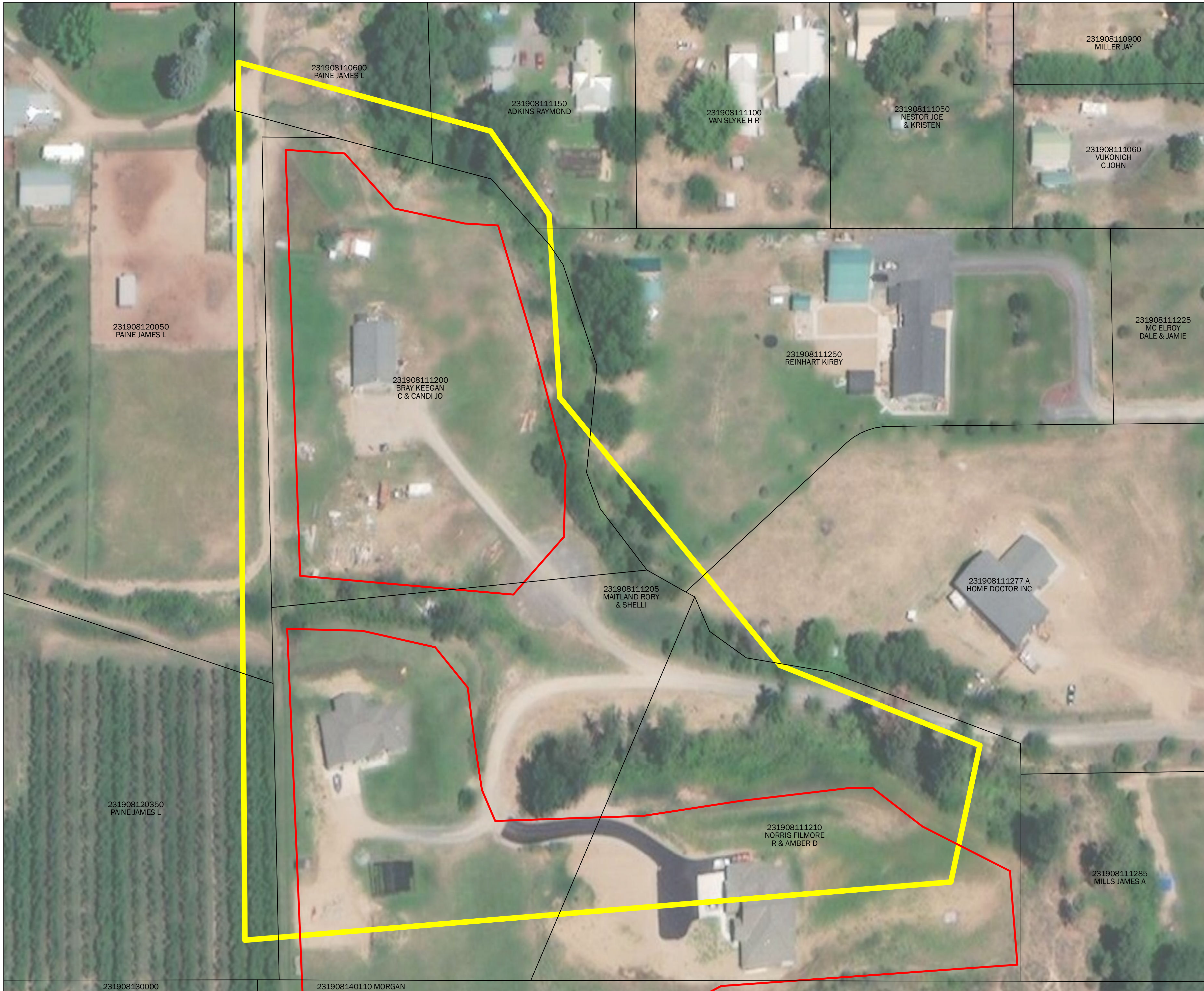
S4-038034CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-18

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-136262CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 12
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 10
Name On Water Right: BRUNNER, VERNON D

Note:

Irrigation ranges from 0.0 to 5.3 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

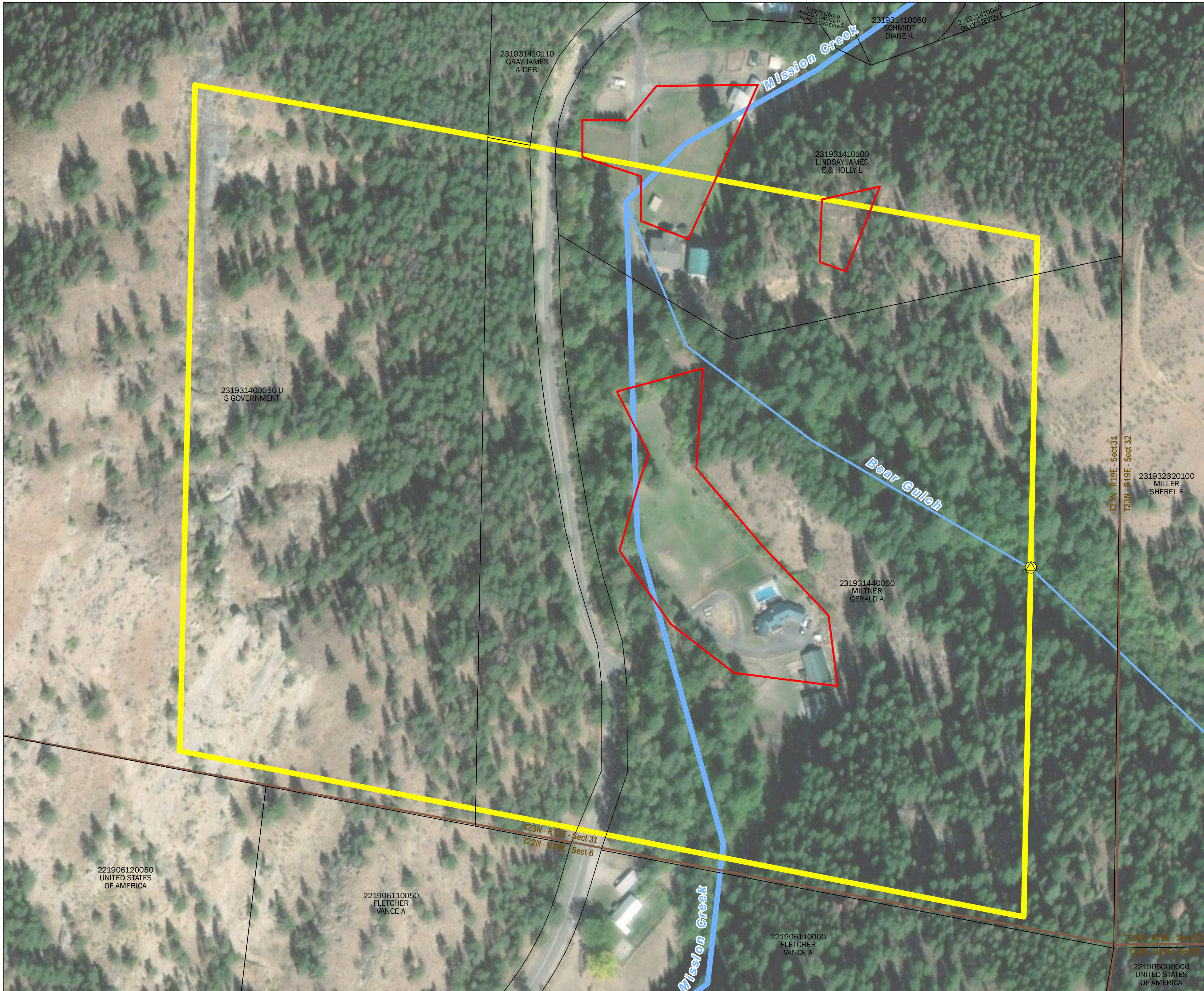
Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-136262CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.	
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-19	



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-200148CL
Water Right Type: Claim L
Purpose: Domestic (General), Irrigation
Irrigated Acres: 10
Instantaneous Rate (cfs): 1
Annual Volume (acre-feet): 10
Name On Water Right: ,

Note:

Irrigation ranges from 4.5 to 4.7 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

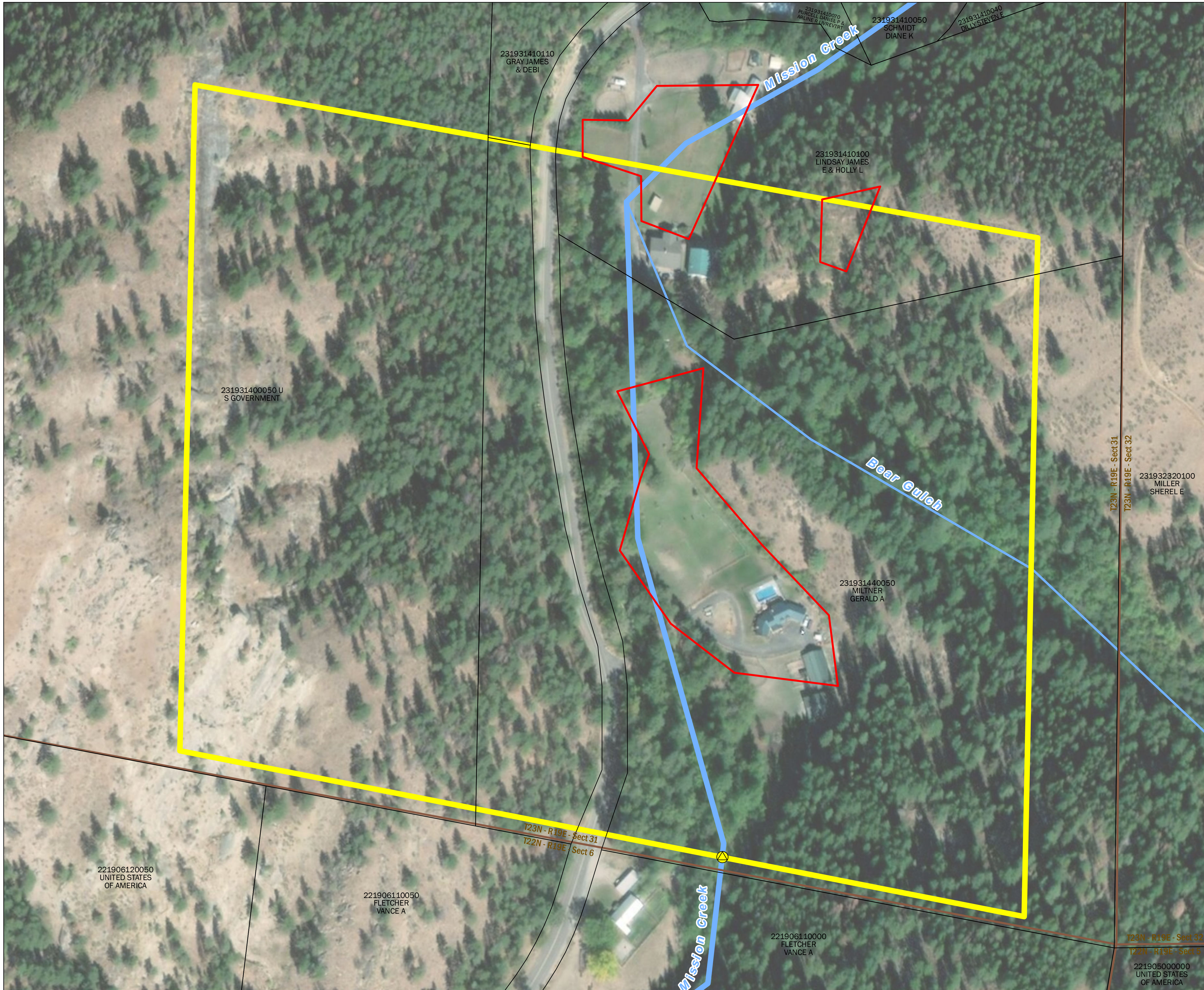
Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-200148CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-20

Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-200147CL
Water Right Type: Claim L
Purpose: Domestic (General), Irrigation
Irrigated Acres: 10
Instantaneous Rate (cfs): 1
Annual Volume (acre-feet): 10
Name On Water Right: ,

Note:

Irrigation ranges from 4.5 to 4.7 acres from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

Mission Creek Basin

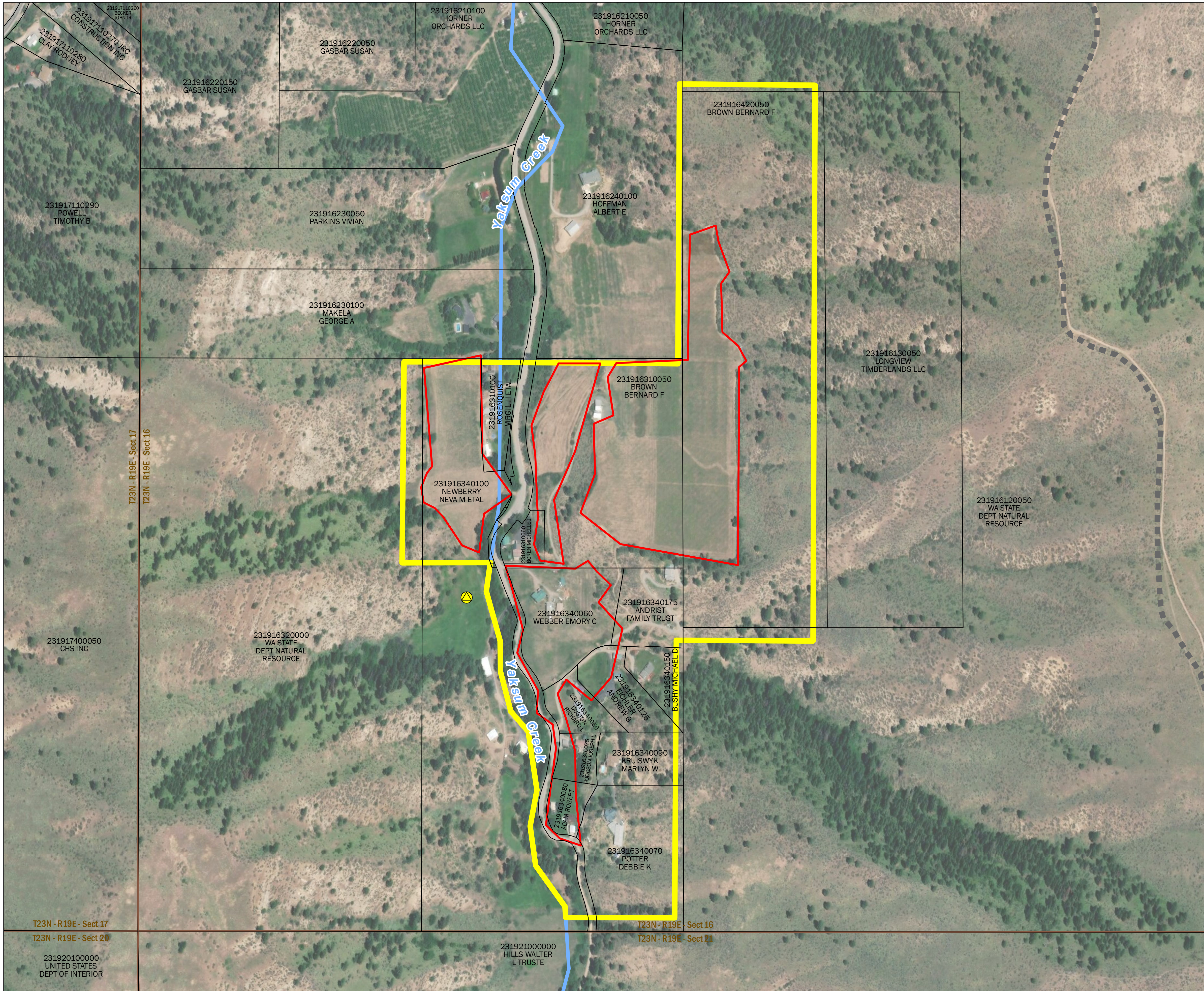
0 190 380
Feet

S4-200147CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-21



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-200126CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 10
Instantaneous Rate (cfs): 26
Annual Volume (acre-feet): 35
Name On Water Right: ,

Note:

Irrigation of approximately 34.2 acres is consistent from 1998 to 2013.

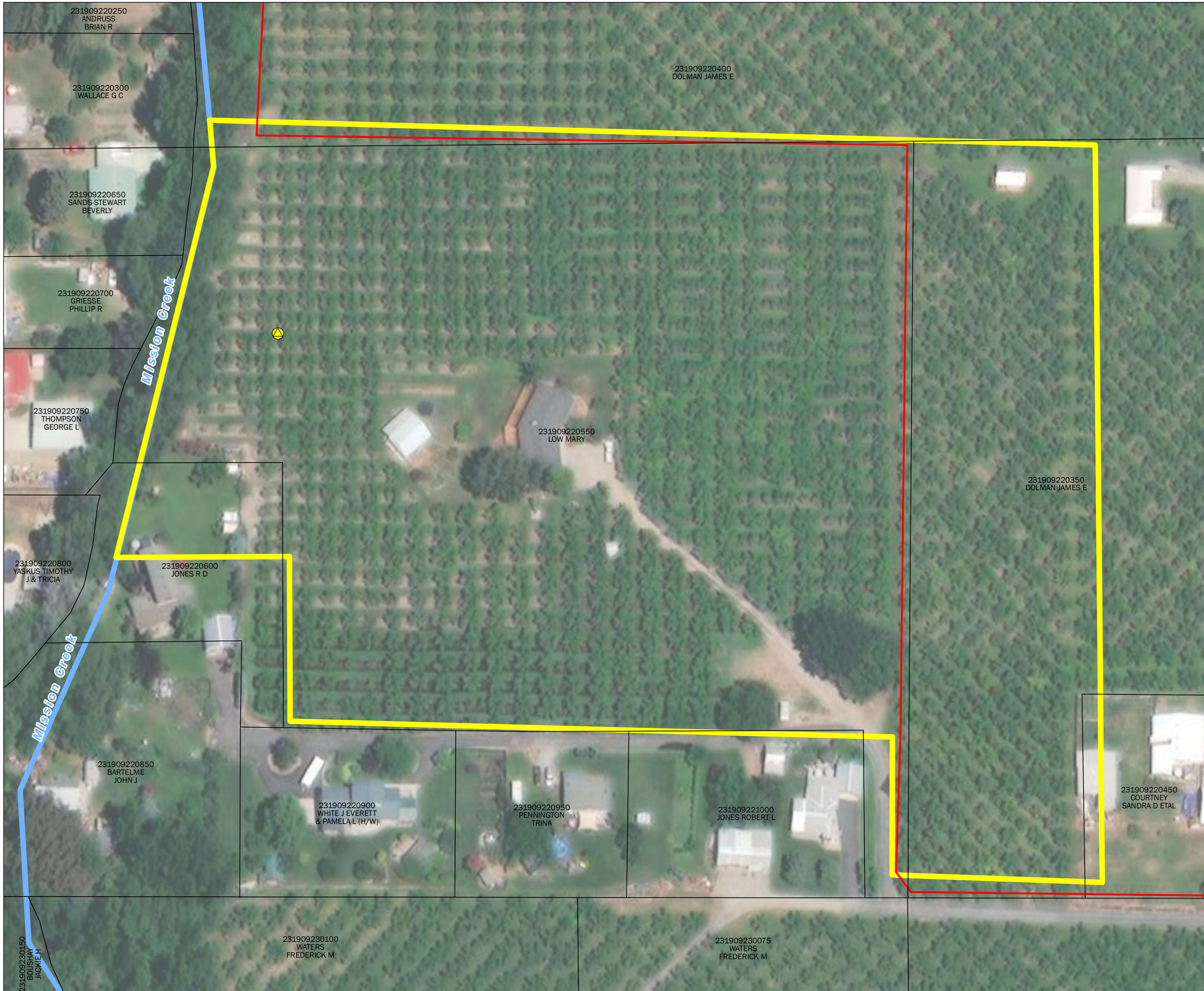
1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-200126CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-22



Water Right Document Info
Water Right Number: S4-122677CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 10
Instantaneous Rate (cfs): 0.12
Annual Volume (acre-feet): 10
Name On Water Right: COLLINS, ELBY

Note:

Irrigation of approximately 14.8 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-122677CL

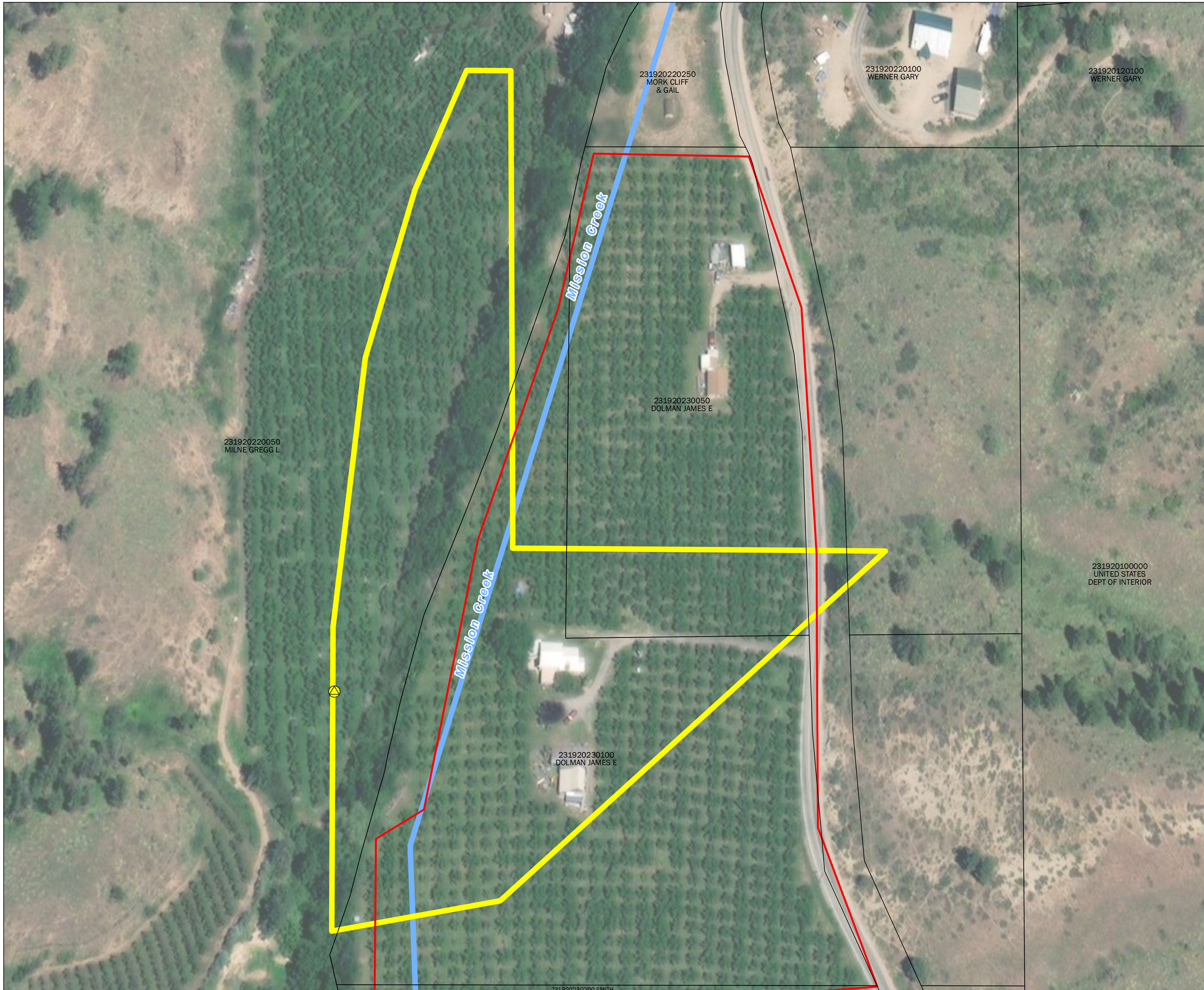
Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING

JUL-2018	BY: PPW	FIGURE NO.
PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-23

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-116134CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 10
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 40
Name On Water Right: DOLMAN, JAMES E

Note:

Irrigation of approximately 10.4 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

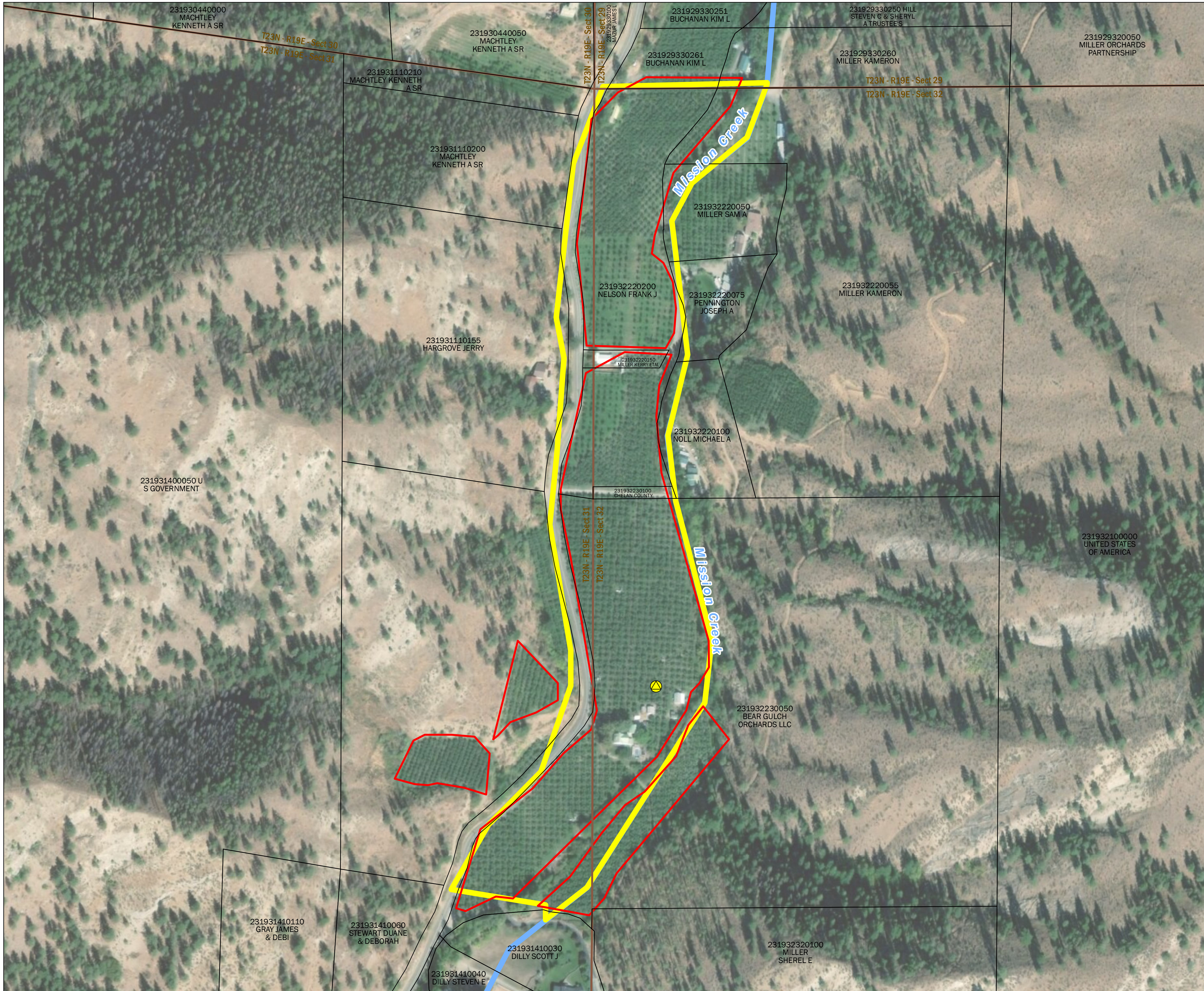
Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

S4-116134CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-24

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-057797CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 7.17
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 36.57
Name On Water Right: ,

Note:

Irrigation of approximately 22 acres consistent is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

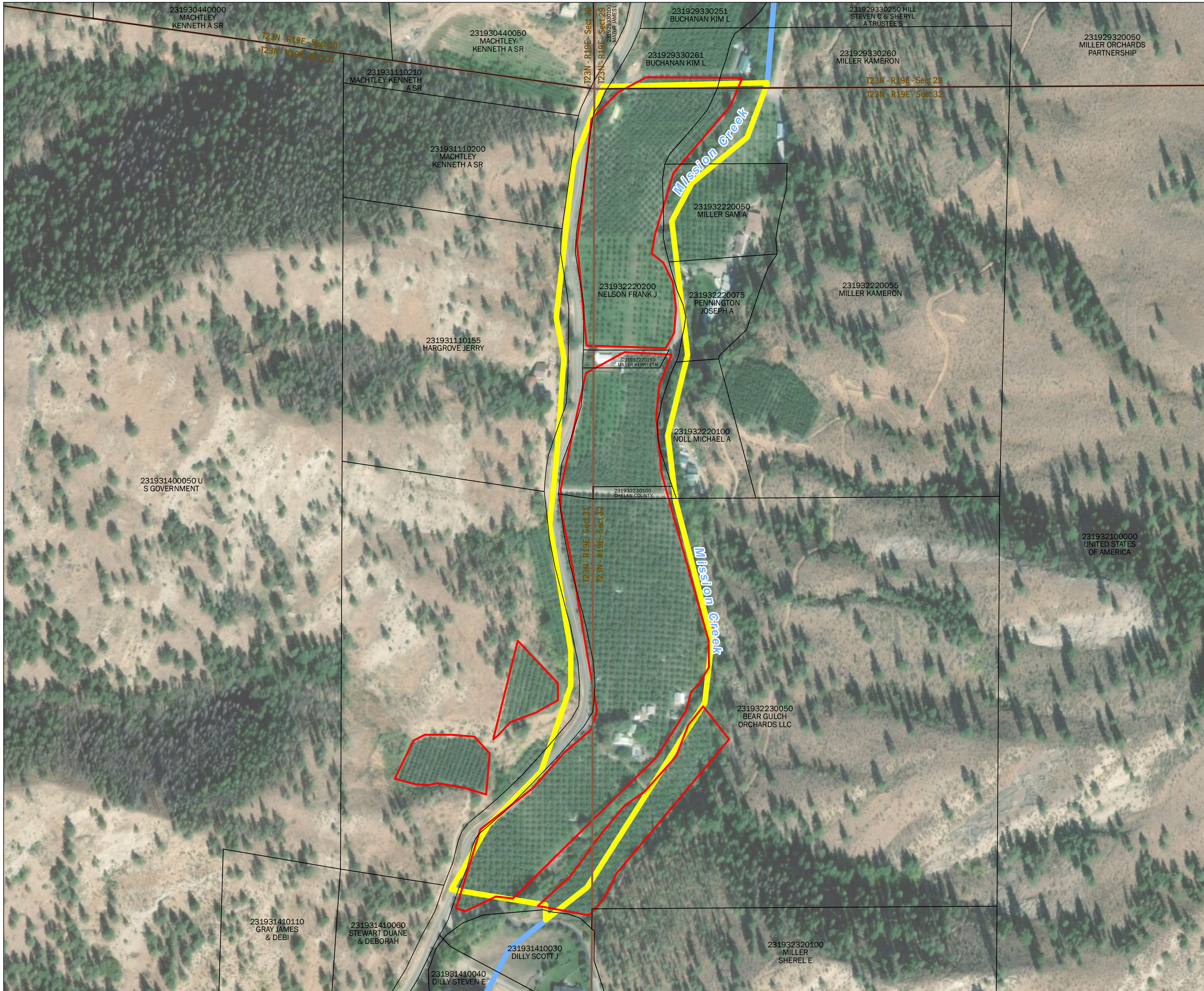
0 330 660
Feet

S4-057797CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING | JUL-2018 | PROJECT NO. 120045-009 | BY: PPW | REVISED BY: JE / RAP | FIGURE NO. A-25

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045\009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulen || Print Date: 7/5/2018



Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Water Right Document Info
Water Right Number: S4-057796CL
Water Right Type: Claim L
Purpose: Irrigation
Irrigated Acres: 9.47
Instantaneous Rate (cfs):
Annual Volume (acre-feet): 48.3
Name On Water Right: ,

Note:

Irrigation of approximately 22 acres consistent is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

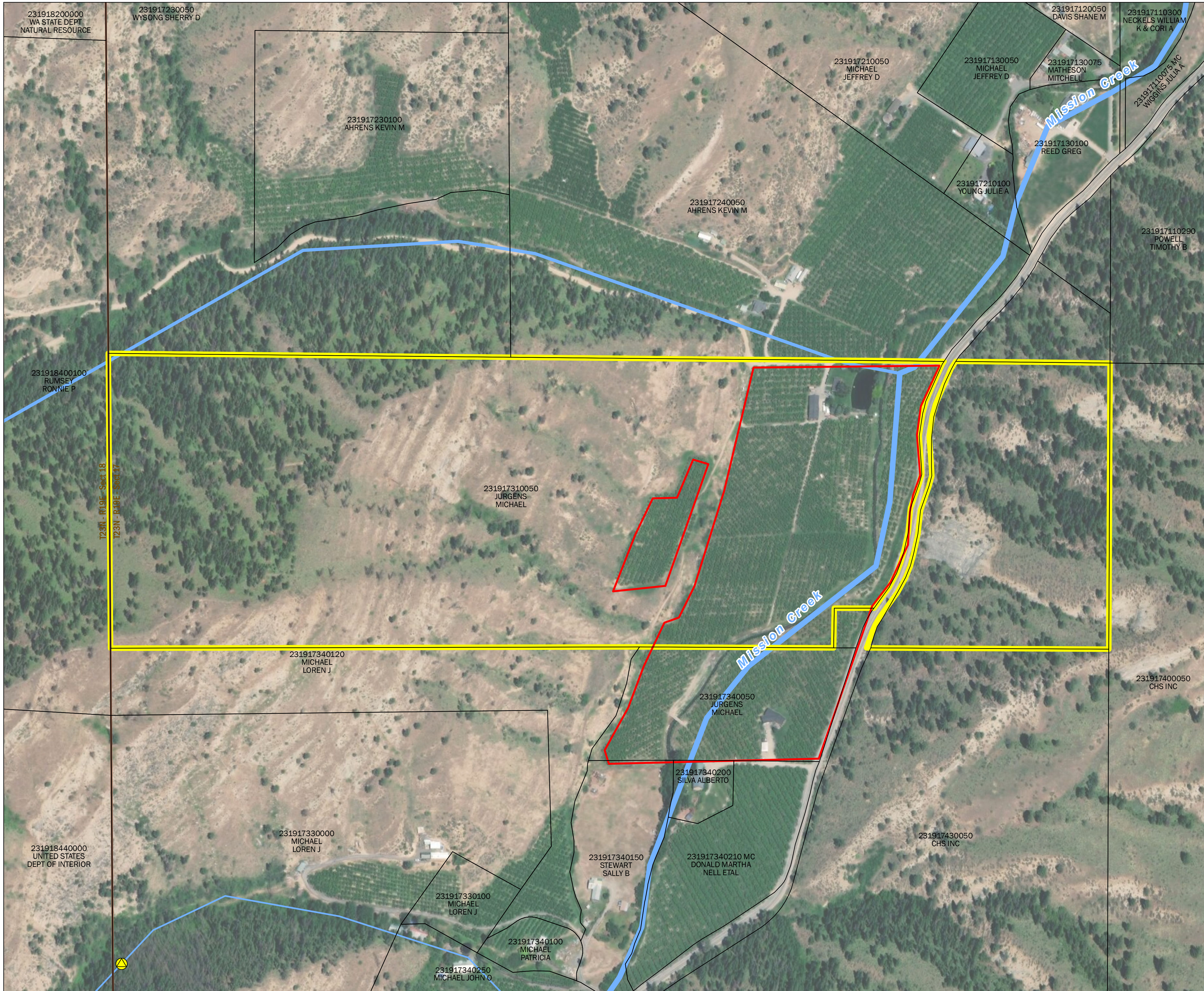
0 330 660
Feet

S4-057796CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING | JUL-2018 | PROJECT NO. 120045-009 | BY: PPW | REVISED BY: JE / RAP | FIGURE NO. A-26

GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045\009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulen || Print Date: 7/5/2018



Water Right Document Info
Water Right Number: S4-301810CL
Water Right Type: Claim
Purpose:
Irrigated Acres: 8.74
Instantaneous Rate (cfs): 0.02
Annual Volume (acre-feet): 872
Name On Water Right: JURGENS, MICHAEL

Note:

Irrigation of approximately 18.7 acres is consistent from 1998 to 2013.

1) Google Earth imagery for all water rights is available for analysis in 1998, 2005, 2006, 2009, 2011, and 2013.
2) Imagery displayed on this map is dated July, 2010 (from Esri/Microsoft).

Aerial Photo Delineated Irrigated Areas
Water Right Place of Use (from Ecology GWIS)
Approximate Point of Withdrawal for Given Water Right
Sections
Mission Creek Basin Boundary
Tax Parcels

N

0 400 800
Feet

S4-301810CL

Mission Creek Water Rights Technical Assistance
Chelan County Department of Natural Resources
Chelan County, Washington

Aspect CONSULTING	JUL-2018	BY: PPW	FIGURE NO.
	PROJECT NO. 120045-009	REVISED BY: JE / RAP	A-27

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GIS Path: T:\projects_8\ChelanCounty_DNR\MissionCreekTechnicalAssistance_120045-009\Delivered\MissionWaterRightReview_MapBook.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 7/5/2018 || User: trulien || Print Date: 7/5/2018